
ENTREPRENEURIAL OPPORTUNITIES
STUDY, MACKENZIE VALLEY

ENTREPRENEURIAL OPPORTUNITIES IN RELATION TO MACKENZIE HIGHWAY AND PIPELINE DEVELOPMENT

by

RMC Resources Management Consultants Ltd.

for the

Government of the

Northwest Territories

November 1974

Environmental-Social Committee
Northern Pipelines
Task Force on Northern Oil Development
Report No. 74-33

The data for this report were obtained as a result of investigations carried out under the Environmental-Social Program, Northern Pipelines, of the Task Force on Northern Oil Development, Government of Canada. While the studies and investigations were initiated to provide information necessary for the assessment of pipeline proposals, the knowledge gained is equally useful in planning and assessing highways and other development projects.

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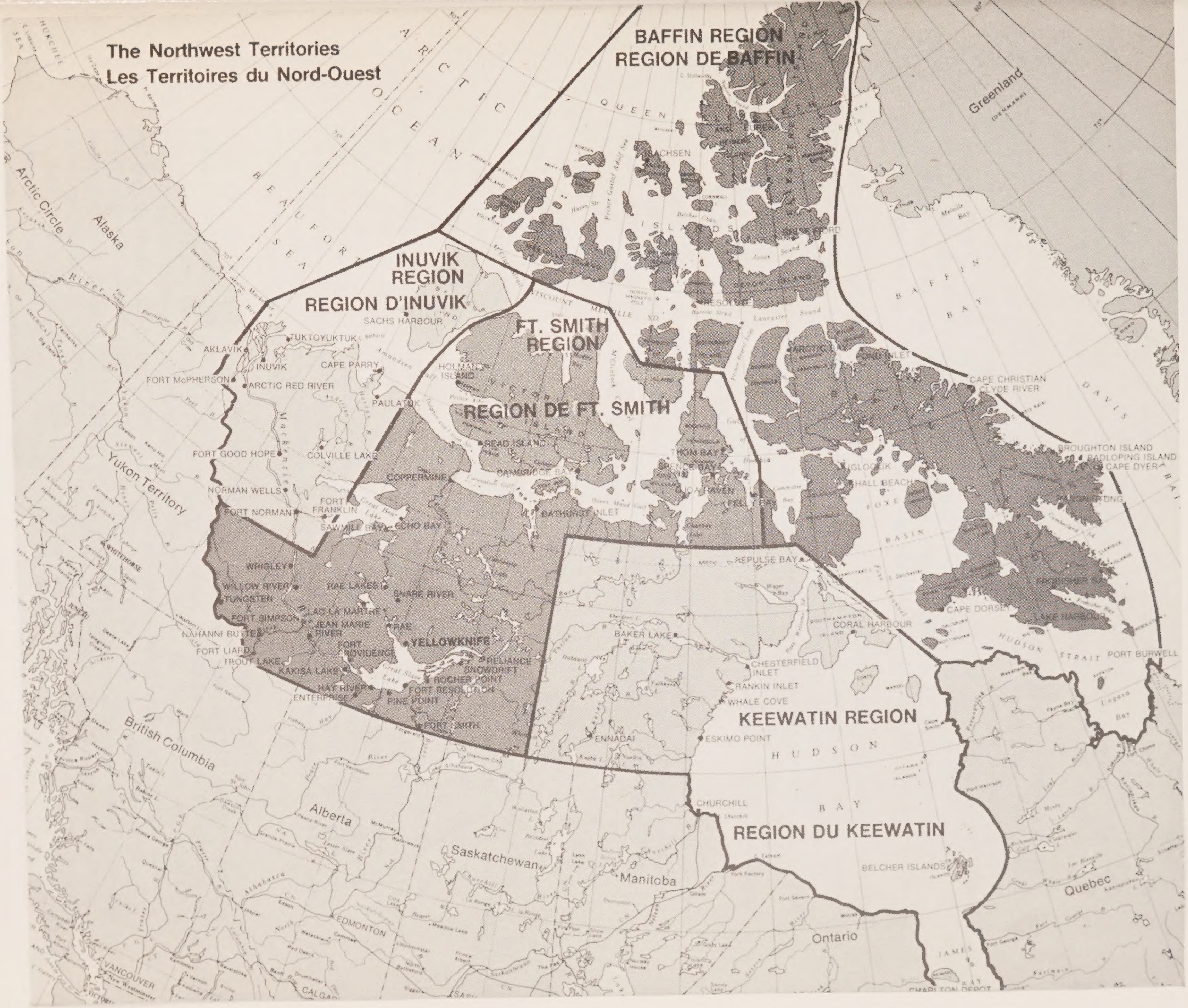
The Northwest Territories
Les Territoires du Nord-Ouest
BAFFIN REGION
REGION DE BAFFIN
INUVIK REGION
REGION D'INUVIK
FT. SMITH REGION
REGION DE FT. SMITH
KEEWATIN REGION
REGION DU KEEWATIN
ARCTIC OCEAN
BEAUFORT SEA
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TUNGSTEN
RAE LAKES
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NAHANNI BUTTE
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FORT LIARD
FORT PROVIDENCE
TROUT LAKE
RELIANCE
SNOWDRIFT
KAKISA LAKE
ROCHER POINT
HAY RIVER
FORT RESOLUTION
ENTERPRISE
PINE POINT
FORT SMITH
ISACHSEN
EUREKA
GRISE FIORD
RESOLUTE
ARCTIC BAY
POND INLET
CAPE CHRISTIAN
CLYDE RIVER
IGLOOLIK
HALL BEACH
BROUGHTON ISLAND
PADLOPING ISLAND
CAPE DYER
PANGNIRTUNG
FROBISHER BAY
CAPE DORSET
LAKE HARBOUR
PORT BURWELL
REPULSE BAY
CORAL HARBOUR
BAKER LAKE
CHESTERFIELD INLET
RANKIN INLET
WHALE COVE
ESKIMO POINT
ENNADAI
CHURCHILL
BELCHER ISLANDS
EDMONTON
VANCOUVER
WHITEHORSE
CALGARY

Résumé en français

L'étude a été conçue sous l'égide du Programme écologique et social, pipelines du Nord, par le Département de l'expansion économique du gouvernement des Territoires du Nord-Ouest. Elle a commencé le 1^er^ avril 1974 et s'est terminée à la mi-octobre de la même année.

Les objectifs de cette étude étaient très simples et très précis. Il s'agissait, en premier lieu, de déterminéer les occasions favorables qui pourraient se présenter aux entreprises à la suite de l'aménagement d'un pipeline, d'une grande route ou des deux, dans la région ouest des Territoires du Nord-Ouest. Le deuxième objectif visait à évaluer la viabilité de ces possibilités, en vue de maximiser la participation locale à celles qui sont les plus réalisables du point de vue financier.

On a estimé que la meilleure façon d'atteindre ces objectifs consistait à envisager la question sur le plan pratique plutôt que théorique. Au lieu d'établir une longue liste des possibilités selon le genre et le nombre, accompagnée de quelques recommandations de principe, il a été décidé d'identifier un nombre restreint d'occasions parmi les plus significatives et de faire l'évaluation économique détaillée de chacune, assortie d'un plan recommandé de mise en oeuvre.

Voici les possibilités que l'on a choisi d'analyser à fond au cours de l'étude: 1) une entreprise de fabrication de logements modulaires, 2) les produits en béton, 3) les services routiers, 4) l'agriculture et 5) les services d'exploitation et d'entretien.

Description

1) Une fabrique de logements modulaires capable de produire 150 unités par an s'est révélée réalisable, compte tenu de ce qu'elle pourrait compter sur une part raisonnable du marché actuel du logement dans les Territoires du Nord-Ouest. Elle ne subirait pas, semble-t-il, la concurrence des prix des autres entreprises du Sud, pour celles-ci, le marché des Territoires du Nord-Ouest n'est que marginal. Cette fabrique pourrait aussi fournir les logements dont les constructeurs du pipeline auraient besoin. Ce serait là un débouché "en or" qui permettrait à l'entreprise d'accroître sa rentabilité tout en se faisant la main, vu qu'en l'occurence les exigences qualitatives seraient quelque peu inférieures à celles du marché courant.

2) En ce qui concerne la fabrication de produits en béton, deux catégories de possibilités se présentent. Une petite entreprise de fabrication de matériaux de construction, capable d'approvisionner le marché actuel et prévisible des Territoires du Nord-Ouest en blocs, briques, etc., semble promise à une existence marginale et exigerait beaucoup de talent et d'énergie. Par ailleurs, on a constaté que de bonnes perspectives s'ouvrent pour plusieurs groupes ou particuliers qui seraient prêts à s'établir le long du couloir pour fabriquer des lests en béton aux fins de la construction du pipeline. Ce genre d'entreprise devrait s'avérer fort lucratif, même en dépit de sa courte durée éventuelle, et fournir aux exploitants des ressources substantielles, susceptibles d'être réinvesties dans les collectivités au titre de projets d'aménagement à plus long terme.

3) On s'est rendu compte qu'il serait possible d'établir trois centres majeurs de services le long de la grande route, pourvu que certaines fonctions de gestion soient centralisées en une sorte de société de holding. A ce niveau, les services établis bénéficieraient de l'apport d'experts financiers et techniques de l'extérieur.

4) On a étudié les chances qu'aurait d'opérer à profit une serre hydroponique utilisant la chaleur excédentaire d'un poste de compression. De même, on a sondé les chances de succès qu'aurait une serre de type conventionnel. Dans un cas comme dans l'autre, les perspectives financières ne sont guère intéressantes à cause de la très forte concurrence qui existe dans ce secteur. Il y aurait peut-être lieu de faire quand même certaines expériences. Le domaine avicole a aussi fait l'objet d'un sondage, mais il s'est révélé très peu rentable.

5) L'étude des services d'exploitation et d'entretien comprend l'examen de la possibilité que l'entrepreneur général du pipeline confie à des sous-traitants plusieurs travaux d'entretien. L'entrepreneur général serait tout aussi heureux d'offrir des contrats d'entretien que d'embaucher lui-même du personnel à cette fin, et il collaborerait étroitement avec le gouvernement en vue de définir les compétences requises. Ce serait là une occasion à long terme très profitable pour les sous-traitants.

Tout au long de l'étude, la société Canadian Arctic Gas Pipeline Ltd. a fait preuve d'une excellent esprit de collaboration. Elle s'intéresse vivement aux résultats de l'étude et, si le gouvernement l'y encourage, elle prendrait volontiers une part active à la mise en oeuvre de certains éléments, entre autres la construction de logements, la fabrication de lests et l'adjudication de contrats pour ce qui est des services d'exploitation et d'entretien.

Mise en oeuvre

Une certaine conception de concrétisation des idées se dégage de cette étude. En termes très généraux, il s'agit d'appliquer à chaque possibilité perçue le meilleur professionnalisme disponible, et de la joindre, dans une entreprise commune, aux ressources humaines locales moins qualifiées sur le plan technique et gestionnel. Au départ, l'objectif consiste à réaliser un transfert graduel de la compétence, dont le succès résidera cependant dans le partage équitable des risques et des bénéfices entre l'exploitant et la main-d'oeuvre locale qu'il acceptera de former. Ainsi, le particulier venu de l'extérieur, ou la firme en cause, aura manifestement intérêt à ce que l'entreprise réussisse.

Dans la pratique, cela signifie qu'on devra établir quel capital spéculatif s'impose pour financer le projet et exiger que le promoteur fournisse un montant proportionné à son capital-actions. Dans toute entreprise commune, le capital spéculatif est le premier à sombrer en cas d'échec. En outre, la firme ou le particulier partagerait équitablement la responsabilité des fonds obtenus par l'entreprise, que ce soit de source gouvernementale ou commerciale. Consentir à assumer les risque dès le début, c'est l'essence même de l'esprit d'entreprise.

De ce qui prédède, on en arrive à un principe de développement fondé sur le dynamisme de l'entreprise privée, qui réalisera l'objectif principal des organismes autochtones, à savoir la participation au capital engagé dans les projets d'aménagement.

La mise en application des résultats de l'étude comporte une très grande contrainte financière. Le Fonds de promotion économique des Indiens (F.P.E.I.) est la seule source pratique de financement qui s'offre à la mise sur pied de concessions dans les Territoires du Nord-Ouest, pour ce qui est des projets de ce genre et de cette envergure. Comme son nom l'indique, ce fonds ne s'adresse qu'aux projets en rapport avec les Indiens. Comme il n'y avait pas d'autre solution, les plans de mise en oeuvre prévus dans l'étude supposent le recours au Fonds de promotion économique des Indiens. Il serait toutefois souhaitable de mobiliser, aux fins des projets envisagés, la participation du plus grand nombre possible d'habitants du district du Mackenzie (dont la majorité n'est pas indienne). Une façon d'y parvenir consisterait à faire appel à la Loi sur les subventions au développement régional ou à d'autres stimulants proposés par le ministère du l'Expansion économiqe régionale. Toutefois, il n'existe encore aucune structure qui permetrait aux non-Indiens des T.N.-O. de se prévaloir de ces avantages à des conditions analogues à celles qui se rattachent au Fonds de promotion économique des Indiens.

FOREWORD

The objectives of this study were quite simple and straightforward. The first was to identify enterpreneurial opportunities which may result from pipeline and/or highway development in the western N.W.T. The second was to assess the viability of these opportunities with a view to maximization of local participation in those which are financially feasible.

It was felt that the best way to accomplish these objectives was to take an action-oriented approach rather than an academic one. Instead of producing an exhaustive list of kinds and numbers of opportunities along with a few policy recommendations it was decided to identify a limited number of the more significant possibilities and do a detailed economic evaluation of each along with a recommended implementation plan.

A philosophy of implementation of these ideas emerges from the study. Expressed in very general terms it involves applying the best technical and entrepreneurial expertise available to a given opportunity in conjunction with local, unskilled, less entrepreneurially-oriented human resources on a joint venture basis.

The objective from the start is a phased transfer of entrepreneurial skills, but the key to its success lies in the sharing of risks as well as benefits in an equitable proportion by the entrepreneur-trainer. In this way the outside individual or firm involved has a clear vested interest in the success and, as importantly, lack of failure of the venture.

The result is a development concept based on the dynamics of private enterprise, which would achieve a prime objective articulated by northern residents: equity participation in development projects.

There is a severe financial constraint to implementation of the study findings. The Indian Economic Development Fund (I.E.D.F.) is at present the only practical

source of concessional development financing available in the N.W.T. for projects of this kind and magnitude. It is, as the name implies, only for Indian-related projects. Since there was no alternative, the suggested implementation plans in the study assume I.E.D.F. funding.

It would be desirable to involve as many residents of the Mackenzie district as possible in these projects. One method of accomplishing this would be the use of Rural Development Incentives Act (R.D.I.A.) or other DREE-type development incentives. It is felt that several of these opportunities might be suited to DREE-type funding. As yet, however, no structure exists which would enable non-Indian N.W.T. residents to avail themselves of these opportunities. This constraint can only be alleviated by access to a non-ethnically based development financing facility.

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INTRODUCTION

Terms of Reference and Direction of the Study

The original and, in turn, guiding terms of reference of the Mackenzie Valley Pipeline and Highway Entrepreneurial Study "Proposed Work Program for the Entrepreneurial Opportunities Study Along the Mackenzie Valley Pipeline and Highway Corridor", presented to the Department of Economic Development, Government of Northwest Territories, April 1974 were as follows:

* Determine the kind and number of opportunities that will result from the construction and operation of the pipeline and the highway, and determine their feasibility from the marketing, operations, human resources and financial point of view.

* Assess the likelihood of the residents of Northwest Territories to take advantage of the opportunities.

* Recommend ways to maximize resident participation, particularly among Natives.

However, at the early stages of the study it became evident that it was both extremely difficult and of doubtful value to attempt to isolate potential business opportunities which are the product of the Territorial environment as opposed to those which would accrue from the gas pipeline and/or the highway. The two were found to be so interrelated that the emphasis of the study shifted to the identification and feasibility of entrepreneurial opportunities of development potential in the Territories whose viability would be enhanced by the gas pipeline and/or the highway.

The format of the study also took on a more pragmatic approach with emphasis on the delineation of as many business opportunities as the budget would allow; whose product is the feasibility and/or assessment of development potential studies presented in this report.

Also, at an early stage it was decided not to dwell on relatively simple and/or service-oriented

opportunities (e.g. taxi businesses, laundromats, stores, handicrafts, etc.) as, it was felt, they could be developed with the existing infrastructure, including the economic development services provided by both the Territorial and the Federal Governments. The objective was to identify and assess a number of development opportunities of significant size/impact that might otherwise not be fully exploited within the staff and budget constraints of the existing agencies.

This flexible approach enabled the study team to review more opportunities and give the deserving one the required degree of attention within the budget constraints than otherwise would have been the case.

A flexible approach was taken with respect to the direction and content regarding each of the studies to reflect more realistically the maturity and thus the timing (i.e. need in relation to development constraints) of each potential development. It was agreed that there was little value in spending an undue amount of time and budget on identified opportunities some distance in the future and that a comprehensive assessment would suffice at this point.

As such, the Modular Housing Plant Study, reflecting the immediate and urgent need for modestly priced shelter in the Territories, presents a complete feasibility study of the project and suggests an action-oriented implementation program, as opposed to, say, the Roadside Services Study whose realization probably is at least five years in the future and is dependent on the priority given by the Federal Government to the completion of the Mackenzie Highway.

As with most studies, the end product of the undertaking is a mixture of satisfaction and partial disappointment. Of the five studies selected for rigorous analysis one, namely "The Feasibility of Establishing Certain Agricultural Enterprises", did not live up to original expectations and compelled the study team not to recommend it for implementation at this time.

Prior to the identification and assessment of development opportunities the consultants undertook a comprehensive literature search to:

(a) Identify and review relevant studies (social, economic, environmental, etc.) undertaken

recently regarding the N.W.T. in general and in connection with the pipeline and highway in particular; and identify statistics, findings, recommendations, etc. of direct value to the objectives of the study (refer to Appendix A).

(b) Identify and review relevant studies (social, economic, environmental, etc.) done in connection with the proposed Alaska pipeline corridor and identify statistics, findings, recommendatons, etc. of value to the objectives of the study (refer to Appendix A).

The study team also identified and interviewed knowledgeable individuals with direct and considerable exposure to the policy formulation, planning and execution of the pipeline and highway (refer to Appendix B) located mostly in:

* Ottawa
* Yellowknife
* Edmonton and Calgary
* Alaska

Visits were made to all significant communities (with the exception of Wrigley) along the proposed pipeline and highway routes to acquaint the consultants with the advantages as well as constraints of development and to have an opportunity to discuss the projects with as many individuals as possible. As this was to be an entrepreneurial study, emphasis was placed on meeting businessmen and individuals responsible for economic development. The discussions encouraged frank assessment of the apparent employment-generating opportunities as well as soliciting opinions regarding additional and/or alternative development projects.

To give the study as factual a base as possible the consultants worked out of the Department of Economic Development offices in Yellowknife; were exposed to a frequent working relationship with the Project Office (Gordon M. Rozon) as well as other members of the staff; subjected to a healthy critique during work sessions were attended by senior officials of relevant departments of the Territorial Government; and close working relationship and cooperation with senior officials of Canadian Arctic Gas Pipeline Ltd.

The study, in essence is the work and cooperation

of many Territorial and Northern Affairs Program officials in addition to that of the consultants; however, we do reserve the right to its shortcomings. We wish to extend our sincere thanks to all the persons that made this study possible.

The body of the report presents five self-contained studies:

STUDY 1 The Feasibility of Establishing a Modular Housing Plant in Hay River, Northwest Territories

STUDY 2 An Entrepreneurial Opportunity Study for Concrete Products Along the Mackenzie Valley Pipeline and Highway Corridor

STUDY 3 The Feasibility of Establishing Service Facilities on the Mackenzie Highway

STUDY 4 An Entrepreneurial Opportunity Study for Small Business Participation in the Operations and Maintenance Activities for the Mackenzie Valley Pipeline

STUDY 5 The Feasibility of Establishing Certain Agricultural Enterprises in the Northwest Territories

...four of which we believe have a relatively high degree of development potential in the Territories presently and/or in the not too distant future.

Funding for the study came from three sources, namely:

* Environmental-Social Program, Northern Pipelines

* Department of Economic Development, Government of Northwest Territories

* Mackenzie Highway Project, Northern Policy and Program Planning Branch, INA

...to whom we wish to express our sincere thanks.

It is against this background that we are pleased to present this report entitled "Mackenzie Valley Pipeline and Highway Entrepreneurial Study".

STUDY 1

THE FEASIBILITY OF ESTABLISHING A MODULAR HOUSING PLANT IN HAY RIVER, NORTHWEST TERRITORIES

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The use of prefabricated materials in residential construction is not a new concept since it has been tried in many situations for centuries. It is only recently, however, that it has taken on a major role in the industry and is now represented in varying degrees in almost 100% of all construction in Canada and the U.S. The degree of prefabrication varies widely from only a few items to the complete housing unit.

The need for prefabrication has increased largely as a result of the rising cost of construction labour and the soaring cost of materials. Construction wages have risen 2.5 times since 1961 and the cost of materials has increased 1.7 times in the same period. By comparison, it is interesting to note that the average cost of a house has only risen 1.5 times indicating to some degree the cost savings due to the influence of prefabrication.

The main role of prefabrication is to reduce the waste of on-site labour and materials by building the components in a factory and transferring them to the building site. Initially, this started with doors, windows, cabinets, etc. and has now been carried to the point where the whole building is often prefabricated and moved to the site.

This report examines the structure of the industry and the opportunity for establishing a prefabrication plant in the Northwest Territories. It is against this background that we are pleased to present this report entitled "The Feasibility of Establishing a Modular Housing Plant in Hay River, Northwest Territories", for your consideration in partial fulfillment of the "Mackenzie Valley Pipeline and Highway Entrepreneurial Study".

2. SUMMARY

2.1 Overview

Housing in the Northwest Territories is not only scarce but extremely expensive. On a per square footage basis it can vary from $25 to $50 per square foot for a modest three bedroom house depending on location.

The high cost of housing is the product of the following major factors:

* isolation, great distances and lack of year-round adequate transportation facilities;
* scarce skilled human resources and thus high cost of labour;
* no local secondary industry and infrastructure, thus high import cost;
* in recent years a relatively rapid population growth rate coupled with a large backlog of housing needs;
* lack of adequate competition in the housing industry in the Territories, especially from local companies.

As the population of the Territories is forecasted to grow at close to 4% per year for the immediate future, the present crisis in the housing industry in the Territories will only be compounded. This report examines the structure of the industry and the opportunity for establishing a prefabrication plant in the Northwest Territories.

2.2 Type and Size of Market

Section 3 of the report examines the housing market in the Territories and estimates the following present and future needs for the type of housing that could be manufactured at the proposed Hay River plant.

Table 1

Total Estimated Market Potential for a Housing Plant in the N.W.T.

	Number of Units									
Type/years	1	2	3	4	5	6	7	8	9	10
Domestic	530	550	930	1025	685	545	565	520	540	560
Export	-	-	50	70	90	110	130	150	170	190
Total	530	550	980	1095	775	655	695	670	710	750

2.3 Nature of Competition

Section 4 of the report outlines the state of the art of the prefabrication industry, defines the necessary ingredients for success (capital, volume, marketing and management), identifies types of competition (modular, precut and mobile) and compares landed cost of prefabricated products in Hay River with that of the proposed plant. Landed cost of competing products is as follows:

* Muttart and Atco — $20 to $25 per square foot
* Mobile Homes — $16 to $20 per square foot
* Proposed Plant — $18.50 per square foot

Recent quotes indicate a price range of between $30 to $50 per square foot for a modest to average three bedroom home depending on location.

2.4 Plant Location

Section 5 examines six possible locations for a plant site from the standpoint of cost of freight, serviced industrial land, cost of services, availability of infrastructure, availability and cost of managerial, skilled, semi-skilled and unskilled labour, and availability of lumber. On the basis of the above, Hay River is recommended as the site for the modular housing plant. Any other location would make the plant less competitive and thus require additional government assistance.

2.5 Manufacturing Facility

Section 6 recommends the most appropriate prefabrication system for the proposed plant (panel system); details its design features; estimates the cost of the system (knock-down cost of $15 per square foot, FOB plant); outlines the plant layout and related requirements; details and estimates the total capital cost of the plant including all equipment and facilities; details and estimates plant operating costs (including managerial, administrative and hourly staff); identifies fixed and overhead costs; and discusses availability of labour.

In summary form the capital and operating costs are estimated to be as follows:

(a) Capital Cost of the Proposed Plant

* Cost of Plant and Land ($449,000)	$450,000
* Cost of Equipment	150,000
	$600,000

(b) Plant Operating Costs

* Hourly Plant Labour $151,680 per annum or about	$1,000/unit
* Middle and Senior Management $157,000 per annum or about	$1,000/unit
* Fixed and Overhead Costs $152,000 per annum or about	$1,000/unit

The section also outlines a plan for the erection of the housing units produced and sold by the Territorial Modular Homes plant, and estimates the complete cost of the units, including cost of freight, foundation and utility cost, and erection and supervision cost at the following rates for communities along the Mackenzie River:

Communities	Cost per Square Foot ($)
Hay River	22.80
Yellowknife	25.90
Fort Simpson	26.00
Wrigley	27.00
Norman Wells	28.30
Inuvik	29.80
Tuktoyaktuk	30.00

2.6 Corporate Ownership and Structure

Section 7 of the report proposes the following corporate scenario and extent of government participation:

(a) incorporate "Territorial Modular Homes Ltd." 51% owned by the Hay River Band and 49% by the Investor/Manager of the plant;

(b) insist on dollar for dollar participation with the potential Operator of the plant in the equity capital required to launch the venture. It is suggested that the individual investment should

be in the $50,000 to $100,000 range for a total paid up capital of between $100,000 to $200,000;

(c) provide a loan via the Indian Economic Development Fund;

(d) insist on a joint responsibility for a line of credit (working capital) at the bank;

(e) provide the Operator with a ten year management contract at the end of which the Band would have the option to buy out the Operator at ten times earnings after taxes or the appraised net value of the plant, whichever is greater; the management contract should be framed in such a way as to both enable the Operator to run an efficient plant as well as to prepare, over the 10 year period, the 51% owners of the plant, i.e. native people, to take over the management of the plant;

(f) endeavour to support the plant, at competitive costs, to the extent of 150,000 square feet of housing (shelter) space per annum.

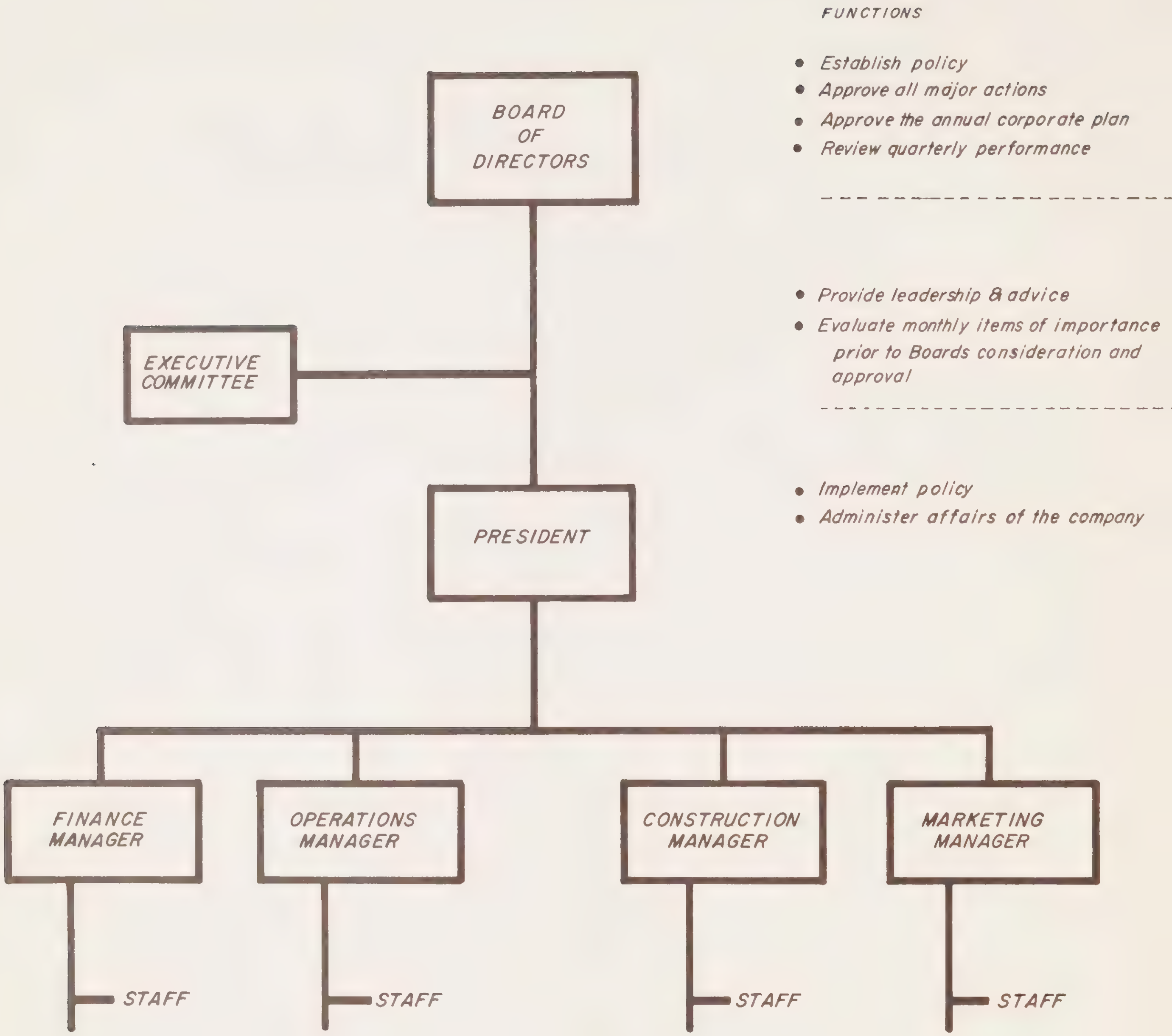
The section also deals with the composition of the Board and its duties and recommends a corporate structure as shown in Exhibit 1.

2.7 Financial Viability and Sources of Funds

Section 8 of the report details the working capital requirements under two different assumptions (Model 1 - $913,850 in Week 11; Model 2 - $135,700 in Week 3) and estimates a pro forma profit and loss statement for the first five years of the plants operations, as shown in Table 2.

From Table 2 it can be seen that the proposed modular housing plant in Hay River would be financially viable from the first year of operations, with profits ranging between the $60,000 and $130,000 level. As the debt charges (i.e. interest) are based on the high (i.e. Model 1) working capital requirements, any other operational arrangements (e.g. prepayment of work by the Applicant, purchase of units by the government at the time of completion, lower interest rates, etc.) would have a most favourable effect on profits.

EXHIBIT 1



corporate structure

Table 2

Pro Forma Profit and Loss Statement
($'000)

	Year 1	Year 2	Year 3	Year 4	Year 5
Houses Sold (Units)	150	200	225	225	225
Sales (@ $16,000/unit)	$2,400	$3,200	$3,600	$3,600	$3,600
Costs of Goods Sold	1,810	2,600	2,800	2,800	2,800
Gross Margin	$ 590	$ 600	$ 800	$ 800	$ 800
Plant Overhead	$ 150	$ 200	$ 250	$ 250	$ 250
Admin. Salaries	150	175	200	200	200
Depreciation	38	35	32	30	28
Interest	70	72	73	69	64
	$ 408	$ 482	$ 555	$ 549	$ 542
Profit Before Taxes	$ 182	$ 118	$ 245	$ 251	$ 258
Taxes @ 50%	91	59	122	125	129
Net Profit	$ 91	$ 59	$ 123	$ 126	$ 129
Plus Depreciation	$ 38	$ 35	$ 32	$ 30	$ 28
Total Cash Flow	$ 129	$ 94	$ 155	$ 156	$ 157

The forecasted profit levels, however, are felt to be sufficiently high to attract a most competent Investor/Manager for the proposed plant.

Section 8 also suggests the following scenario with respect to ownership and sources of funds:

* Investor/Manager	$ 75,000
* Hay River Band	75,000
* Loan	450,000
CAPITAL COST	$600,000
WORKING CAPITAL (maximum line of credit)	$900,000

Investor/Manager ($75,000 for the purchase of 49% of the Company): RMC Resources Management Consultants Ltd. have located an Investor who has both the financial and the technical capability to undertake the project on a turn-key basis and to assume the ten year management contract.

Hay River Band ($75,000 for the purchase of 51% of the Company): A grant of $75,000 from the Indian Economic Development Fund.

Loan ($450,000): A loan from the Indian Economic Development Fund at 6¼% on the first $25,000 and 8¼% on the balance.

Working Capital (maximum $900,000): A line of credit at the bank supported by a joint guarantee by the Government and the Investor/Manager. A line of credit at the bank would also be enhanced by virtue of Canadian Arctic Gas Pipeline Ltd. (Applicant) intentions of placing an order for an 800 man camp with the proposed plant and willingness of the Applicant to pre-pay part of the order. Any further orders from the Applicant would only reinforce the positions vis-a-vis line of credit at the bank.

2.8 Blueprint for Action

As it is the intention of the Applicant to proceed with the initial phases of the construction of the gas pipeline the winter of 1976-1977, the proposed plant would have to be in operation, at the latest, autumn 1975 in order to both complete the order for an 800 man camp for the Applicant as well as build a number of housing units to prove to such agencies as the Northwest Territories

Housing Corporation its ability to offer quality housing at competitive prices. Every effort should also be made, needless to say with the full support of the Applicant, to complete in whole or at least in part, the shelter needs of a second 800 man camp.

Section 9 outlines a detailed time-phased program to enable the Territorial Modular Homes Ltd. to be in operation by October 1, 1974 and to this end offers the following proposal:

> RMC Resources Management Consultants Ltd., in addition to lining up the Investor/ Manager, would also be prepared to assume the full responsibility, i.e. on a turn-key basis, for the implementation of the work program as outlined in section 9 including the design and preparation of:
>
> (a) organization plan;
> (b) marketing, operations and financial plan;
> (c) management information and accounting system;
> (d) organizational manual including position descriptions of all key positions;
> (e) procurement, production planning, scheduling and inventory control systems;
> (f) labour standards;
> (g) all other aspects of management.

3. TYPE AND SIZE OF MARKET

3.1 Housing Stock 1973

The market for prefabricated housing can be divided into two geographic areas (see Exhibit 2): the Fort Smith and Inuvik regions which are served by the highway and/or the Mackenzie River and Western Arctic barge services; and the Baffin and Keewatin regions which are primarily served by ship from Montreal. Only the two western regions could be served by a housing plant in the Mackenzie Valley area.

A survey conducted by the Northwest Territories Housing Corporation over the period August 1973 to April

EXHIBIT 2

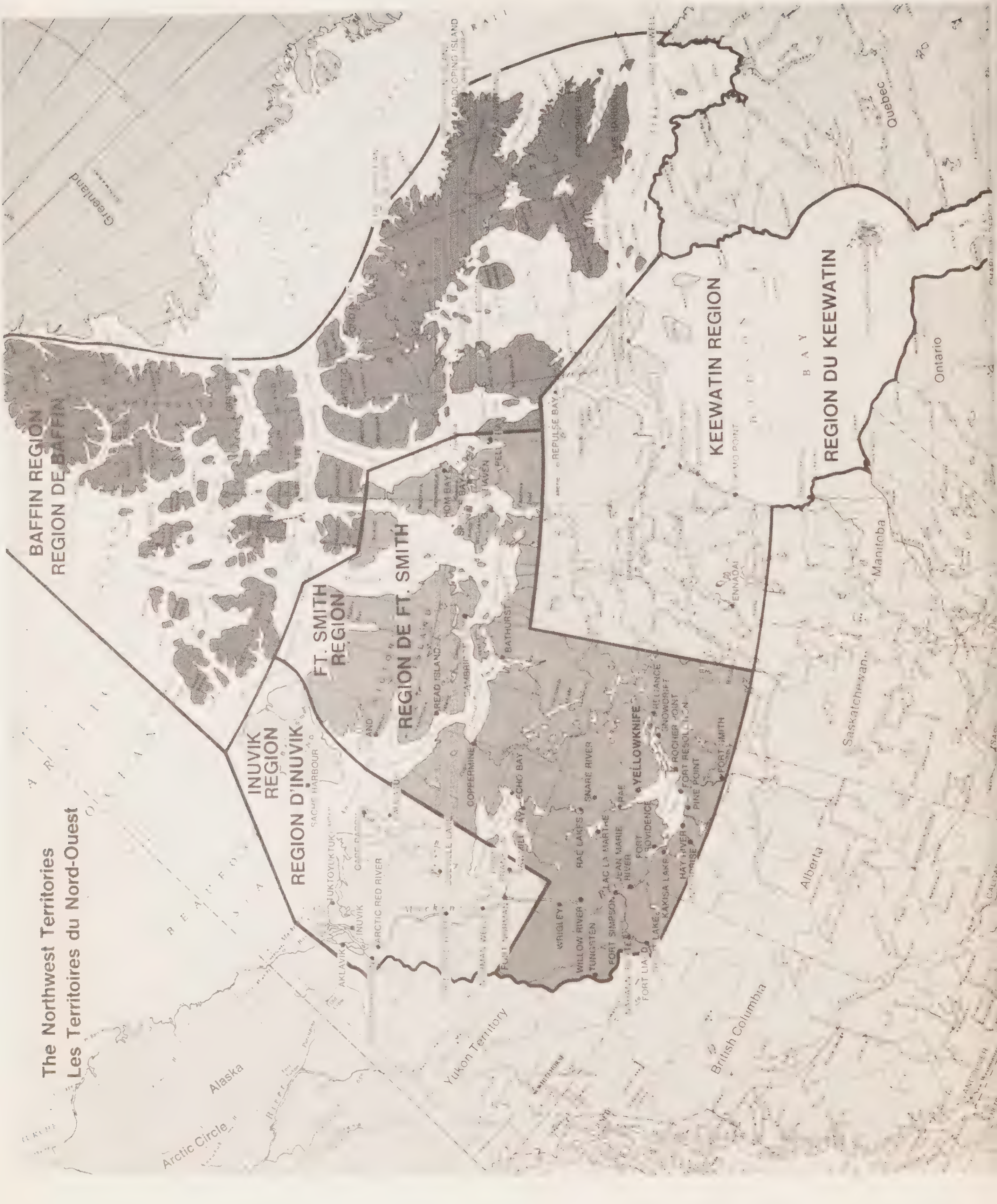

The Northwest Territories
Les Territoires du Nord-Ouest
BAFFIN REGION
REGION DE BAFFIN
INUVIK
REGION
REGION D'INUVIK
FT. SMITH
REGION
REGION DE FT. SMITH
KEEWATIN REGION
REGION DU KEEWATIN
YELLOWKNIFE
Greenland
Alaska
Arctic Circle
Yukon Territory
British Columbia
Alberta
Saskatchewan
Manitoba
Ontario
Quebec

Table 3

Housing Stock in the Fort Smith and Inuvik Regions

Housing units[1]	5,362 units
Average density	3.68 persons/unit
Population observed in survey	19,742 persons
Population of communities not covered in survey	2,870 persons
Adjusted population of survey area	22,612 persons
Adjusted number of housing units (to compensate for communities not covered in the survey)	6,145 units
Estimated 1973 population of the Fort Smith and Inuvik Regions	29,135 persons
Apparent net housing density (29,135/6,145)	4.74 persons/unit
Housing units (Pipeline Study Region - 1972[2])	5,077 units
1972 population (Pipeline Study Region)	22,807 persons
Net housing density (22,807/5,077)	4.49 persons/unit
Assume average density of (3.68 + 4.49 + 4.74/3)	4.30[3] persons/unit
Estimated housing stock (29,135/4.3)	6,776 units
SAY	6,800 units

[1]Source: N.W.T. Housing Corporation unpublished survey: Need and Demand for Housing in the N.W.T. (1973-74)

[2]Source: Canadian Arctic Gas Application.

[3]This averaging assumes that the density observed by the Northwest Territories Housing Corporation survey was low (they missed some people or used low population estimates) and that the survey also missed some housing units (this was certainly true in some communities where only native houses were counted).

1974, counted 5,362 housing units in the Fort Smith and Inuvik regions. Allowing for the communities not covered and using densities observed in that study and a similar study reported in the Gas Pipeline Application by Canadian Arctic Gas, the total housing stock in 1973 is estimated at 6,800 units (see Table 3).

Of this total about 19% are government low rental units, another 27% government staff housing, 17% company housing, 25% owner occupied, 8% privately owned rental, and 4% public housing, senior citizens housing and single persons housing (Appendix I). Altogether the various Governments and governmental agencies own about 50% of the housing.

In terms of the condition of the housing stock, the Housing Corporation survey estimated that about 14% of the low rental and owner occupied housing had a life expectancy of less than five years, with a further 7% between 5 and 10 years. Canadian Arctic Gas estimated that 18% of the housing was in poor condition.

There are no comprehensive statistics on the different types of housing in the N.W.T.: single family dwellings, row housing, apartments and mobile homes. Information prepared by the City of Yellowknife shows that although single family permanent dwellings still make up the largest single group (45%), apartments now constitute 33% of the total housing units, up substantially from 1970. Mobile homes and row houses are also significant and growing quickly. Throughout the Fort Smith and Inuvik regions it is probable that about 30% of the housing units are mobile homes, apartments or row houses.

Table 4

Yellowknife Housing Stock

Type of Dwelling	Units 1970		Units 1974	
Single Family	846	(60%)	1,025	(45%)
Mobile Home	160	(11%)	318	(12%)
Row Housing	64	(5%)	196	(8%)
Apartments	336	(24%)	756	(30%)
sub-total	1,406	(100%)	2,295	(90%)
Institutional	n.a.		251	(10%)
TOTAL	1,406	(100%)	2,546	(100%)

Source: City of Yellowknife

3.2 Housing Demand 1975-1984

The Housing Corporation survey (Appendix II) estimates that 843 units are needed immediately to replace existing units (i.e. units which should be condemned) and to correct severe overcrowding problems. Assuming that these units can be built over a five year period, this means about 170 new units per year.

In addition, new housing units are needed to accommodate the growing population. Several projections of population have been made by different sources but there is little agreement on either the population base or the growth rate.

Table 5

N.W.T. Population Projections

Source	Base	1971 Population	Projected Growth Rate 1971 - 1981
Lu and Mathurin (INA)	1971 Census	34,810	3.6 - 3.8%/year
Canadian Arctic Gas	Estimates for the Pipeline Study Region	-	7.7
T. Forth (NWT)	1971 Census	34,810	4.5
N.W.T. Government	1971 Census and Estimates	35,805	6.3*

*To 1975 only.

The estimates of population growth range from 3.6 to 6.3% per year, with a mean of about 4.3% per year if we weight the N.W.T. Government (i.e. projection to 1975) by a factor of one half.

Due to an overall trend toward smaller families and a relative increase in the white population, the average density of persons per housing unit will continue to fall and the demand for houses can be expected to increase faster than the increase in population.

If we include the houses immediately needed, the total housing stock in the Fort Smith and Inuvik regions would be about 7,600 units and the average density would be about 3.8 persons per housing unit. Assuming a marginal density of 3.0 the required increase in housing units would be about 420 per year. Based on the low and high population estimates, the range is about 350 to 610 new housing units per year in the Fort Smith and Inuvik regions. Of the above figure, however, only about 70% (i.e. the market potential of prefabricated/modular homes) or 290 units per year could be regarded as single family units.

Table 6

New Housing Units Required

Estimated housing stock	6,776 units
Houses needed immediately	843 units
Apparent housing stock requirement	7,619 units
Estimated population - 1973	29,135 persons
Apparent density (29,135/7,619)	3.82 persons/unit
Estimated marginal density	3.00 persons/unit
Projected population growth rate	4.3% per year
Projected housing growth rate (4.3 x 3.82/3.00)	5.5% per year
Housing units required	419 per year

The last component affecting the requirement for new houses is the continuing need to replace existing houses due to old age and poor repair or fire. The Housing Corporation survey (Appendix III) estimated that 20% of the houses had a life expectancy of less than 10 years which would suggest a replacement of about 2% per year. However, it is assumed that many of these units would be replaced under the immediate need program and a conservative estimate of 1% per year is used for replacements.

With respect to the effect of the proposed pipeline, excluding petroleum exploration, Canadian Arctic Gas has estimated that the gas pipeline would create about 1,044* permanent jobs. For the purpose of the study we estimated that one half of this total would be represented by heads of households (as opposed to singles) and of these,

*Sum of Delta gas industries, development and production plus pipeline operation plus secondary employment.

in turn, about one-half would be new residents to the Territories. Assuming a gradual buildup over four years this means an additional housing requirement of about 65 units per year.

During the construction of the pipeline about six large 800 man construction camps will be required. Each camp will contain about 140,000 square feet, equivalent to about 120 houses. The total required would therefore be equivalent to about 360 houses per year for the first two years of pipeline construction.

3.2.1 Domestic Market Potential for Prefabricated and Modular Housing

Assuming the start of construction of a natural gas pipeline in 1977, the total demand for new housing units in the Fort Smith and Inuvik regions is shown in Table 7.

Table 7

Domestic Market Potential for Prefabricated and Modular Housing (1975-1984)

Type	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Normal growth	290	310	320	340	360	380	400	420	440	460
Immediate need	170	170	170	170	170					
Replacement	70	70	80	90	90	100	100	100	100	100
	530	550	570	600	620	480	500	520	540	560
Pipeline permanent	-	-	-	65	65	65	65	-	-	-
Construction Camps (housing equivalent)	-	-	360	360	-	-	-	-	-	-
	530	550	930	1025	685	545	565	520	540	560

3.2.2 Potential for Export

The major markets outside the Northwest Territories would be northern Alberta and possibly the north shore of Alaska. When completed the Liard Highway could also open up markets in Northern British Columbia and the

Yukon. Northern Alberta however, especially with respect to the Athabaska Tar Sands development, will constitute the major export potential for a prefabricated housing plant in the Territories; especially if it is located in the Hay River area.

For the purpose of the study we will assume a 50-unit potential in the third year of operations, increasing by 20 units per year thereafter (see Table 8).

3.2.3 Total Market Potential

Table 8

Total Estimated Market Potential for a Housing Plant in the N.W.T.

	Number of Units									
Type/years	1	2	3	4	5	6	7	8	9	10
Domestic	530	550	930	1025	685	545	565	520	540	560
Export	-	-	50	70	90	110	130	150	170	190
Total	530	550	980	1095	775	655	695	670	710	750

Senior officials of Canadian Arctic Gas Pipeline Ltd. have indicated their willingness to place as much business with the proposed Hay River plant as it can handle within the constraints of time; needless to say, at a competitive cost.

The square footage of one camp could keep the plant busy for one year, especially the first year of operation. Such an order would also have the following advantages:

(a) facilitate a line of credit at the bank especially since it guarantees a 12-month operation;

(b) enable management to plan one year in advance and labour to "cut their teeth" on a product line that does not require as high a quality standard (especially with regards to finish) as do housing units;

(c) line-up suppliers and obtain economic order

quantities;

(d) attract management and skilled labour.

From a strategy point of view, if the plant were in operation the latter part of 1975, it would be in a position to complete one 800-man camp in time for the start of the Mackenzie Valley Pipeline the latter part of 1976. It could also give the Hay River plant the opportunity to do all or at least part of the second camp.

4. NATURE OF COMPETITION

4.1 State of the Art of the Industry

The role of prefabrication has been most successful in single family dwellings because it is here that repetitive techniques and standardization have been most needed. Prior to World War II, most houses were assembled on a custom made basis and items such as windows and cabinets were all made to fit individual houses. Labour and materials were relatively inexpensive and the costs of these methods were acceptable at the time.

During the war, the demand for readily constructed buildings for the military led to the design of a wide range of buildings—the most famous of which was the metal Quonset hut. After the war, there were many efforts to transfer these techniques to the residential area but rejection of the "prefab" buildings by the public was overwhelming.

During the postwar building boom, increasing standardization and repetition were adapted by many builders in an effort to provide low cost housing in the face of overwhelming demand by returning veterans. Rows of starkly similar buildings in straight lines became a common sight around many cities. While ugly, they were reasonably priced and served a major need. Surprisingly, these communities have become highly desirable today as the trees have grown, extra rooms have been added and the gardens have become pleasant while their cost has stayed at reasonable levels.

By the 1950's, as the demand for houses of any

type started to ease, customers became more selective and shunned the low quality of design of the "Levittown" houses that had sprung up, so developers started to design more attractive street layouts and more varieties of homes to create the so-called "suburbia". While given a higher degree of individuality, there was a strong trend toward modular construction for windows, cabinets, doors, etc., bringing about increasing use of prefabrication. Standard sizes of components permitted assembly in factories with transfer to the building sites.

By the mid-1950's, there were several prefabricated houses on the market that had managed to overcome the stigma of the post-war units. The main acceptance came for vacation homes, partially on the basis of low cost and partially through some very original designs. At the same time, there was a rising demand for trailers that started out as mobile units for cars, but soon grew into semi-stationary homes.

As the cost of on-site labour increased, increasing use of prefabrication was made and larger and larger components were built at the factory. Some firms have pursued the idea of making most of the major components in a plant while another group builds completed homes that could be moved to the site.

Thus, there are presently three major types of prefabricated homes on the market. These are called in this report under the following categories.

(a) *Precut homes* are units which are shipped to the site with all the lumber and materials precut and numbered. At the site the erectors only nail the parts together. Some units do not need nails and rely on interlocking timbers. These types of houses have found great acceptance in the cottage and small home market. They eliminate a lot of waste and labour because components are precut and the carpenters need only assemble the units. They are also popular with the "do-it-yourself" market.

(b) *Modular homes* take the process one step further by the use of panels, usually in 2, 4, 6, and 8 foot widths that can be assembled on the site. Many of these units are prewired, insulated and plumbed at the factory. Most are prefinished on the exterior wall to eliminate final painting or maintenance. These units can be erected more

quickly than the precut homes and take the reduction of waste and labour another step further.

(c) *Mobile homes* are the final step since a unit is almost completely finished at the plant, even to the furniture and appliances, and is trucked directly to the site. The only work is to set the unit on a foundation and to connect the services.

The standard of the industry is still the "stick builder" who purchases a variety of materials from different sources and custom cuts them on the job site. About 75% of the single family, detached homes in Canada are still built in this method, usually in large cities where there is a ready supply of building materials, ready availability of labour and strong source of subcontractors. The prefabricated methods are favoured in rural areas where these facilities are not available and where labour is scarce and expensive.

The four different methods of construction are reasonably competitive among each other. There is never any "best" method of supplying housing except when one specific building in one specific area is considered vis-a-vis another. However, in the remote areas where supplies, labour and materials are scarce, prefabrication does have many advantages especially where there are only a few units being built in each community.

The traditional contractor for houses in Canada has been the small builder who puts up under 25 houses per year. Until recently there were only one to two dozen firms that built more than 100 houses per year but this group has expanded rapidly, especially with the entry of the row house builders and prefabricators.

The prefabricated home segment of the single family housing market is generally recognized as the fastest growing portion of the market, having come from virtually no representation to 25% of the share of the market in the last ten years. There are basically three main routes into the prefabricated industry:

* backwards integration from contracting;
* diversification from a sales/rental base;
* direct set-up and entry.

4.1.1 Backwards Integration

Backwards integration from contracting has been the largest source of successful firms. Many of these organizations started as small contractors that expanded to the point where they could establish and support their own prefabricated house plants. This is especially true among many of the precut houses where the firms started building cottages or houses and soon expanded to a point where they could justify precutting their units in a plant.

Once they had a successful operation selling through their captive markets, the step to selling kits to the "do-it-yourselfer" or other contractors was an easy one. Many have since discontinued their own contracting forces and rely entirely on the franchise contractor.

4.1.2 Diversification from a Sales/Rental Base

Diversification from a sales/rental base is another large source of prefabricated houses. Firms such as Beaver Lumber of North American Lumber have followed this route successfully using their many building supply stores as sales outlets. This is also largely aimed at the "do-it-yourselfer" or the person who hires a small contractor to erect the building for him.

4.1.3 Direct Set-up and Entry

Direct set-up and entry is typical of the mobile home industry where firms enter to provide houses for people by establishing a network of dealers. This is also typical of the firm offering a few components that can be utilized by contractors, such as trusses and cabinets. Many firms have entered the market to supply complete houses to contractors who, in turn, are responsible for erecting and selling them. This path into the industry is a difficult one and there have been many financial failures through under-capitalization, competition and/or market rejection.

It takes a well financed and well managed firm to enter this market directly as the competition for dealers and contractors is fierce. Firms that have started up some years ago usually have found the best dealers and they have built up their distribution systems to make competition difficult.

As a result, there are several major distinguishing characteristics about the prefabricated house builders that are readily apparent. These characteristics are important for any firm entering the market because they must be observed if the company is to be successful. These include:

(a) *Capital Intensive* - setting up a prefabricated housing plant is capital intensive and requires far more capital for inventory than is realized by many new firms entering the industry. The most common reason for failure is under-capitalization. Some firms with $2 and $3 million in capital have had spectacular failures;

(b) *Large Volume* - most prefabricated home builders need the ability to move large numbers of houses each year to cover their operating costs. Survival requires these large volumes in order to cover the high capital investment;

(c) *Effective Marketing* - production of homes is not enough and the successful firms also must have effective marketing programs that can sell and build the houses. Without an effective marketing group, the factory cannot move sufficient volume to survive. Many firms have built high efficiency operations to fabricate houses but have gone bankrupt waiting for their inventory to be utilized;

(d) *Effective Management* - is also important as the industry is overrun by too many amateurs. The successful firms have skilled help that are not only familiar with the construction industry and the financing of projects but are also innovative and daring in the use and design of materials.

Without the provision of all four of these characteristics a new firm will have difficulty surviving in the competitive environment unless it has a markedly different product, or a protected market as a result of high transportation costs.

Both of these advantages potentially exist for a plant in the Northwest Territories to some extent but it should be realized that in themselves they are not sufficient to ensure financial success.

4.2 Types of Competition

There are some 50 prefabrication building firms in Western Canada supplying either wood or metal buildings for residential, commercial and farm usage. Many of the same firms also supply mobile homes and bring the total of builders of mobile homes to over two dozen. It should be noted, however, that many of these mobile homes are the type that are skid-mounted sheds rather than the more attractive wheeled units sold in the residential market.

Table 9 shows the names of some of the larger suppliers of mobile and prefabricated housing; and their plant locations, the number of employees, and the use of wood or metal in the units. This is not meant to be a complete list but does represent the larger builders of their kind in Western Canada. Some are in fairly shaky financial condition and may not be in full operation but are included as having been active until recently.

4.2.1 Mobile Homes

Many of the firms listed are also in the mobile home segment of the market, although several supply shelter of various types.

The largest firm in the mobile housing market (which we have stretched to include portable buildings, schools, etc.) is Atco Industries Limited of Calgary. This firm dominates the industry and is now a major factor in the world-wide shelter market, selling units from Alaska to the Middle East.

Other large firms in the mobile housing market are Commodore, Frontier, Homco, Kainai (under the Wieches branch name), Muttart, Pyramid and Safeway. Many of these are firms from the U.S. that have established operations in Alberta in order to move into the Canadian market.

4.2.2 Precut Homes

There are four large suppliers of precut houses in Western Canada. Muttart Industries Limited started in this market over 30 years ago and is still one of the leading suppliers. It has since branched into other markets, such as mobile homes, and has been able to do this because of its strong market and distribution network.

Table 9

MAJOR SUPPLIERS OF PREFABRICATED SHELTER IN WESTERN CANADA

Name	Locations	Employees	Wood	Metal
Atco Industries Limited	Calgary, Alta			
	La Salle, Que.	500+	x	x
	Nampa, Idaho			
Beaver Lumber Company Ltd.	Yorkton, Sask.	100	x	x
	Prince Albert, Sask	30	x	x
Commodore Mobile Homes Ltd.	Calgary, Alta.	150	x	x
Engineered Homes Ltd.	Calgary, Alta.	125	x	x
Fleetwood Homes of Alberta Ltd.	Red Deer, Alta.	150		
Frontier Homes Limited	Weyburn, Sask	55	x	x
Harrigan Industries Limited	Richmond B.C.	30	x	
Homco Industries Limited	Estevan, Sask	75		x
	Kelowna, B.C.	90		x
Kainai Industries Limited	Standoff, Alta.	100	x	x
Missawa Homes of Canada Ltd.	Gimli, Man.	40	x	
Muttart Industries Ltd.	Edmonton, Alta.	220	x	x
	Acheson, Alta.	25	x	x
	Regina, Sask.	60	x	x
National Homes Limited	Abbotsford, B.C.	35		
Nelson Lumber Company Ltd.	Lloydminster, Alta.	400	x	
Neonex Housing Industries	Calgary, Alta.	200	x	
	Vancouver, B.C.	25	x	
North American Lumber Ltd.	Winnipeg, Man.	150	x	
	Prince Albert, Sask	25	x	
Pyramid Mobile Homes Ltd.	North Battleford, Sask.	150		x
Safeway Shelter Systems Ltd.	Claresholm, Alta.	200	x	x
Sunset Builders Limited	Edmonton, Alta.	35	x	
Village Square Limited	Kenora, Ont.	40	x	
Westwood Homes Limited	New Westminster, B.C.	32	x	
Weyburn Industries Limited	Weyburn, Sask.	35	x	x

There are three lumber firms that hold a very strong market position because of their distribution network. The Beaver Lumber Company Ltd. probably is the largest in precut homes and cottages because of its strength in Eastern Canda and reportedly sells from $12 to $15 million worth of these units annually through its outlets.

Nelson Lumber Company Limited in Lloydminster (Alberta and Saskatchewan) dominates the western portion of the prairies, while North American Lumber in Winnipeg is strong throughout the Manitoba and Northwestern Ontario markets. Engineered Homes Limited in Calgary sells a higher quality, higher priced precut package to developers and its own subsidiaries throughout the prairies. By both building and supplying its components, it holds a good reputation in the standard single family dwelling market.

4.2.3 Modular Housing

Modular housing is just emerging as a viable operation. There are several firms predominently committed to panel construction but all are still relatively small compared to the firms mentioned under the precut and mobile markets. Many of the precut companies are incorporating panels in their design and it is our opinion that the modular panels will eventually become the most effective and versatile building system for low cost, good quality homes.

Missawa Homes of Canada Limited in Gimli, Manitoba is the subsidiary of the original Japanese firm that is reportedly the largest manufacturer of houses in the world. Its 1974 volume is expected to be in excess of 50,000 units worldwide. The Canadian operation, however, is having financial problems and is not selling at its anticipated level. The firm makes several dozen different sizes of plywood panels that can be quickly assembled (under two days) to erect a house. Because of the wide variety of panels, shapes and sizes, almost any configuration of a house can be built.

Other firms such as Village Square Limited in Kenora and Harrigan Industries Ltd. in Richmond, B.C. use interlocking panels to provide quickly erectable housing units. Village Square Limited provides fibreglass facings and urethane foam insulation in its units to provide low maintenance exterior and high warmth interiors.

Another firm from California, Domar Systems (Canada) Ltd. is entering the Western Canadian market using a stressed skin panel and dome concept but so far has not found a location for a plant.

4.3 Nature of Competition in the Northwest Territories

The present market in the Territories for single family dwellings is being met by mobile homes, stick built homes and a range of prefabricated homes. The principal suppliers of the prefabricated units are Webber (Yorkton), Muttart (Edmonton), Beaver (Edmonton), Atco (Edmonton) and Kainai (Lethbridge).

With the exception of mobile homes which have considerably lower design standards, the costs of stick built and prefabricated homes are similar. For example, Table 10 shows the result of a tender called in the fall of 1973 for the construction of 20 three bedroom homes in Fort Smith. They are about 1,050 square feet with full basements and will be used for government staff housing.

Table 10

Example of Housing Costs (Fort Smith - 1973)

Contractor	Type of Construction	Bid Price
		$
Kainai	Sectioned Prefab	28.95/sq.ft.
Webber	Prefab	29.05/sq.ft.
Poole	Stick Built	29.67/sq.ft.
Atco	Prefab	30.90/sq.ft.
Prairie Western	Stick Built	37.24/sq.ft.
Foundation	Stick Built	44.29/sq.ft.

The top several prices are quite close and there is little difference in price between the prefabricated and the stick built houses. The prefabricated houses would be relatively more competitive for the construction for a single home. Poole Construction estimated that the cost in Yellowknife for a single home was about $45.00/square foot in the summer of 1974.

This year the N.W.T. Government is buying a large number of staff houses from Muttart, for the various

settlments in the form of prefabricated panels. The unit cost for the 65 units, 1,030 square foot area, is $16,000 FOB Edmonton. An additional $18,000 to $20,000 has been budgeted for shipment, construction and finishing in the settlements. This gives a total price of $33 to $35 per square foot. A recent quote in Inuvik for a duplex indicates a price in the $50 per square foot range.

To get a better appreciation of the present cost of housing in the Territories in relation to the competitive position of the proposed modular housing plant at Hay River (see Section 5, "Plant Location") at a knock-down and, in turn, assembled cost of $15.00 and $18.50 per square foot respectively, let us analyze the landed cost of competitive products at Hay River.

Muttart Modular Homes* (Edmonton) landed in Hay River range from $20.10 to as high as $22.60 per square foot as shown below:

Fury 2 Bedroom 24'x34' (816 sq.ft.)		
* Price FOB Edmonton	$15,180	
* Deliver to Hay River	2,800	
* Joining the two halves	460	
Price FOB Hay River	$18,440	($22.60/sq.ft.)

Meteor 4 Bedroom 24'x56' (1,344 sq.ft.)		
* Price FOB Edmonton	$23,295	
* Delivery to Hay River	3,100	
* Joining the two halves	575	
Price FOB Hay River	$26,970	($20.10/sq.ft.)

Muttart homes normally come prefabricated in two sections and, as such, are not what is normally regarded as the "modular" type; they do produce it in prefabricated panels to specific orders.

The Atco (Western) Ltd.* plant in Calgary also produces a line of prefabricated homes that are constructed in two, 12 foot modules at the plant and joined on-site, to form a 24 foot wide home. The units come in 44, 46 and 48 foot lengths and landed in Hay River cost the following amounts:

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*Detailed information has been deposited with the N.W.T. Department of Industry and Economic Development.

24'x46' Three Bedroom Unit (1,104 sq.ft.)

* Price FOB Calgary	$24,300	
* Delivery to Hay River	2,400	
* Joining the two halves	1,500	
Price FOB Hay River	$28,200	($24.60 per sq.ft.)

24'x48' Three Bedroom Unit (1,152 sq.ft.)

* Price FOB Calgary	$24,900	
* Delivery to Hay River	2,400	
* Joining the two halves	1,500	
Price FOB Hay River	$28,800	($25.00 per sq.ft.)

Mobile homes are considerably cheaper than prefabricated housing units on a square footage basis especially when we consider that the price includes a number of items of furniture and furnishings. Also the cost of delivery to Hay River is about one-third the cost of prefabricated housing. The main disadvantage of mobile homes is their rapid rate of depreciation and thus short life expectancy. (Detailed information on mobile homes has been deposited with the Department of Industry and Economic Development, Government of the Northwest Territories.)

Prices of mobile homes vary considerably reflecting both size and quality variations as shown in Table 11. The $16 to $20 per square foot price range compares most favourably with prefabricated models at the $20 to $25 range but offers no serious competitive threat to the modular type of houses, at about $18.50 per square foot, to be manufactured at the Hay River plant; especially in light of the superior quality of the latter.

The advantages and disadvantages of the various types of single family dwellings are summarized below. The main advantage of a mobile home is the low cost. This is offset by its short life expectancy and the fact that it tends to depreciate while a reasonably maintained house appreciates in value. The stick built house has the advantages of flexibility and familiarity. The main disadvantages are higher cost and a large on-site requirement for skilled labour. The modular houses are usually lower in price and require less time and skilled labour to assemble. Prefabricated and sectioned houses (which come in two pieces) exhibit these advantages even more strongly but this is offset in many instances by higher transportation costs.

Table 11

Mobile Home Prices (FOB Hay River)

Type	Price Per Unit	Price Per sq.ft.
	$	$
2 Bedroom		
12'x52' (624 sq.ft.)	11,400 - 12,100	18.30 - 19.40
12'x60' (720 sq.ft.)	13,200 - 14,200	18.30 - 19.70
12'x64' (768 sq.ft.)	14,300 - 15,900	18.60 - 20.70
14'x52' (728 sq.ft.)	12,400 - 13,900	17.00 - 19.00
14'x60' (840 sq.ft.)	14,800 - 15,700	17.60 - 18.70
14'x64' (896 sq.ft.)	15,900 - 16,500	17.70 - 18.40
3 Bedroom		
12'x52' (624 sq.ft.)	11,700 - 12,400	18.80 - 19.90
12'x60' (720 sq.ft.)	13,700 - 14,400	19.00 - 20.00
12'x64' (768 sq.ft.)	15,000 - 16,400	19.50 - 21.30
14'x52' (728 sq.ft.)	12,400 - 14,100	17.00 - 19.40
14'x60' (840 sq.ft.)	15,000 - 16,800	17.90 - 20.00
14'x64' (896 sq.ft.)	14,600 - 17,900	16.30 - 20.00
14'x65'4" (915 sq.ft.)	16,100 - 17,700	17.60 - 19.30

The most commonly cited disadvantage of the prefabricated units is their uniformity and lack of visual appeal or variation. As a group, single family dwellings cost more than comparable space in apartments or row houses. In a number of settlements the difference is substantial due to the high cost of serviced land. The extra space, higher status and desire for ownership tend to outweigh the price disadvantage for many people.

5. PLANT LOCATION

Considering the population distribution, i.e. concentration (market demand) on the one hand and existing rail/road network (cost of inbound and outbound freight) on the other, the obvious locations for the proposed plant are communities south of and including Fort Simpson. This argument is further reinforced by such other considerations as the availability of:

* managerial/administrative skills;
* skilled labour;
* municipal services including competitive hydro;
* infrastructure, i.e. sub-contract work, repair and maintenance, etc.;
* other.

Table 12 highlights the cost of inbound freight for the different communities at the south of Fort Simpson.

Table 12

Landed Cost of Materials From Edmonton

Plant Location	Mode of Transport*			
	Rail/ Truck**	Ranking	Truck	Ranking
	$		$	
Fort Smith	1,096	(3)	1,108	
Fort Resolution	1,120		1,108	(4)
Hay River	656	(1)	908	
Fort Providence	1,060	(2)	1,108	
Fort Simpson	1,180		1,176	(5)
Yellowknife	1,120	(6)	1,244	

*Based on 40,000 lbs. loads from Edmonton

**Rail to truck transfer cost $5.00/ton

As shown in Table 12 Hay River is by far the best location followed by Fort Providence and Fort Smith. If all materials were brought in from outside (say Edmonton) we could be using as much as six million pounds of raw materials or the equivalent of 150 loads (based on a production rate of 200 units per year). The difference in landed cost of materials between Hay River and the next best location (Fort Providence) could be as high as $60,000; $66,000 for Fort Smith; $78,000 for Fort Simpson; and $84,000 for Yellowknife.

The delivery cost of the finished product, as shown in Table 13 also favours Hay River followed by Yellowknife and Fort Providence.

Since the total weight of 200 units could be as high as six million pounds, the cost advantage of the Hay

Table 13

Delivery Cost of Finished Product[1]

Community	Housing[2] Units	Plant Location[3] Hay River	Fort Smith	Fort Resolution	Fort Providence	Fort Simpson	Yellow-knife
	#	$	$	$	$	$	$
Inuvik Area	36	93.60	137.52	119.88	93.60	93.60	124.56
Norman Wells	16	27.04					
Fort Simpson	11	14.30	22.99	17.60	7.15	-	19.03
Fort Providence	9	7.38	15.21	10.26	-	5.85	11.43
Yellowknife-Rae Area	58	56.84	75.40	53.36	73.66	100.34	-
Hay River	26	-	39.26	21.32	21.32	33.80	25.48
Pine Point/Fort Resolute	20	16.40	27.40	-	22.80	32.00	19.60
Fort Smith	24	36.24	-	32.88	40.56	50.16	31.20
TOTAL HOUSING	200						
Deliver Cost of 200 Units at 100 lbs. per unit		251.80	361.46	294.02	286.13	341.83	270.66
Ranking of Locations		(1)	(6)	(4)	(3)	(5)	(2)

[1] Based on Northern Transportation Company Ltd., Class 5 rates and 100 lbs. per unit.

[2] Based on population distribution, present housing needs, need for low cost single family dwellings and intuition.

[3] Potential plant locations.

River location over Yellowknife could be as high as $5,658, and that of Fort Simpson $27,009. The total freight advantage of Hay River over all the other locations is summarized in Table 14.

Table 14

Inbound and Outbound Cost of Freight

Plant Location	Total Cost of Freight	Plant Location Ranking
	$	
Hay River	173,940	1
Fort Providence	244,839	2
Fort Resolution	254,406	3
Yellowknife	264,198	4
Fort Smith	272,838	5
Fort Simpson	278,949	6

Hay River has the following additional advantages:

(a) *Industrial Park* - cost of industrial land in New Town for a 200' x 300' lot is $2,400 unserviced and $6,650 serviced. The existance of serviced land is most important. The 100 acre Vale Island industrial park development with excellent rail and road facilities would probably be a better site for the proposed plant provided the services are available in time for the plant construction. At the time of writing neither the timing nor cost of services including cost of land were known for the proposed industrial park.

(b) *Services* - availability and/or cost of services (water, sewages and hydro) are far superior at Hay River than any of the other locations. For example, as the plant could be a relatively heavy user of hydro, the rates at say, Yellowknife, Fort Simpson and Hay River bear witness as to the choice of the location:

* *Yellowknife*

5.8¢ per K.W.H. or $5.00 per K.V.A. of demand, whichever is the greater

* *Fort Simpson*

less than 10 K.V.A.
$1 per K.W. per month + 8¢ per K.W.H.

greater than 10 K.V.A.
$3 per K.W. per month + 8¢ per K.W.H.

* *Hay River*

demand charge $620 per month or $3 per K.W.H. (K.V.A.)

energy charge	0 - 40 K.W.H.	...8.2¢ per K.W.H.
	41 - 200 K.W.H.	...4.8¢ per K.W.H.
	201 - 400 K.W.H.	...3.2¢ per K.W.H.
	Over 400 K.W.H.	...2.7¢ per K.W.H.

(c) *Availability and Cost of Infrastructure* - Hay River and Yellowknife probably rank equally followed by Fort Smith and Fort Simpson.

(d) *Availability and Cost of Managerial/Administrative and Skilled Labour* - Hay River and Yellowknife probably rank equally followed by Fort Smith and Fort Simpson.

(e) *Availability and Cost of Semi-Skilled and Unskilled Labour* - the need for about 26 workers, some of which may be females, does not pose a a serious restriction on any one of the locations, with communities of lower economic activity and higher native population (i.e. Fort Resolution, Fort Providence and Fort Simpson) enjoying an advantage.

(f) *Availability of Local Lumber* - saw mills in Fort Resolution, Fort Smith and Fort Simpson enhance their locations. However, the need for either kiln-dried lumber (preferred) or no less than adequately air-dried lumber, not to mention guaranteed supply of graded lumber, poses some doubt as to the source of supply. The Hay River location would have the advantage of flexibility as to source of supply (South versus local) and the extent of dependence.

Taking all of the above arguments into consideration we propose Hay River as the recommended site for the modular housing plant. Any other location would make the plant less competitive and thus require additional government (Federal/Territorial) assistance.

6. MANUFACTURING FACILITY

6.1 Choice of the System

The development of a prefabricated housing plant in the Northwest Territories must hinge on four main conditions:

* there must be a steady and rising market for housing in the Territories;
* the product must provide quality and comfort under local conditions;
* the cost must be competitive with imported housing units; and
* it must make use of local labour and materials wherever possible.

In assessing the various types of houses that could be built in the Northwest Territories, our research delineated several other conditions that were felt to be necessary or desirable for a locally produced housing unit. These include:

(a) Erection and enclosure of the units should be quick (i.e. two days or less) and should be able to utilize local labour. Interior finishings can then be finished in a more leisurely fashion in comfort.

(b) All skilled work such as plumbing and electrical work should be done at the plant, leaving only hookup of the services to be done on site.

(c) High transportation costs suggest a collapsible unit to be packed in the highest weight cube for transit.

(d) Design and style should permit flexible layouts from 700 to 1,400 square feet floor plans, and be similar in appearance to traditional homes.

(e) Heating and insulation should use the most efficient methods possible.

(f) Exterior walls and trim should be low maintenance material such as metal or plastic.

(g) Fire protection should be as high as possible within reasonable cost.

(h) Units should have the flexibility to be put together to provide multiple unit dwellings, if needed.

(i) The unit should be most competitive in the 700 to 1,400 square foot house floor plan since this is where the most pressure is for desirable housing.

From a conceptual point of view, the decision appears to be in favour of a panel system that can have both the interior and exterior walls prefinished but which can be bolted, glued or otherwise joined quickly in the field. One of the major stumbling blocks affecting this type of system or concept in Southern Canada has been the plethora of building codes and the local building inspectors who insist upon seeing all the wiring and construction. It would appear feasible for the proposed plant in Hay River that all wiring and plumbing would be inserted into the panels at the factory and inspected at that time.

There is a variety of panel systems on the market with various interlocking methods. Some systems have entire walls made to length in the factory and shipped complete while others use varying lengths and widths of panels. Most have chosen a basic 4' x 8' panel since this is the size of a standard sheet of plywood or gypsum board. It is also approximately the height of a ceiling in a normal house.

The use of a standard 4' x 8' module permits variations ranging from a 2' x 8' panel to an 8' x 8' panel (that would hold a picture window). This keeps the sizes of the panels to a weight that can be handled by two to three men while larger sizes generally require power machinery for transfer, or larger crews. Some systems from Europe use larger panels but the panels require up to ten-man crews to move the materials and put them in place.

Storage and shipping generally favour the smaller panels since they can be more easily stacked for compact storage. Materials for a 1,000 square foot house run from 30,000 to 40,000 pounds (depending on the exterior and interior finishes) and most can be fitted on a flat bed truck or into a close van. The advantage of this technique is that a 1,000 square foot house can be shipped in one

truckload, whereas a bolt-together mobile home will require two trucks for the same size house. The space requirements will be approximately double for a completely fabricated unit on a barge compared to panel type house.

Erection time for most panel system units is usually less than two days, provided the foundation is ready when the unit arrives. Many firms can claim the erection and enclosure of a shell in less than one day but this usually requires more than a five-man crew. The system that we visualize would normally require only a five-man crew for closure and take approximately two days. The use of locking devices on the panels would permit the use of local labour during erection provided adequate supervision was available.

6.2 Design of the System

As noted above, there is a multitude of panel systems on the market and each has its own advantages and disadvantages. We would recommend a simple system of panels as shown in Exhibit 3, which consists of:

* floor panels;
* roof panels or trusses;
* gable ends; and
* wall panels.

The wall panels are provided in sufficient sizes and configurations to be able to construct virtually any size and shape of floor plan that would be wanted. Houses can be made in L-shaped or T-shaped floor plans simply by converting to the appropriate panel where doors, windows, corners, etc. are needed. This permits variety in subdivisions without excessive cost since the panels are all made in a uniform assembly process. While it requires good production control to put the wiring, plumbing or other materials into the panels as required for the varying designs, the cost on a per house basis for the custom tailored layout is relatively negligible in the total cost of the house.

The basic units of panel built houses are the wall units since it is possible to utilize more conventional floor and roof systems, if needed. The panelized roof and floor systems can be added at later dates to the manufacturing process, if felt desirable.

basic Components of Panel built houses

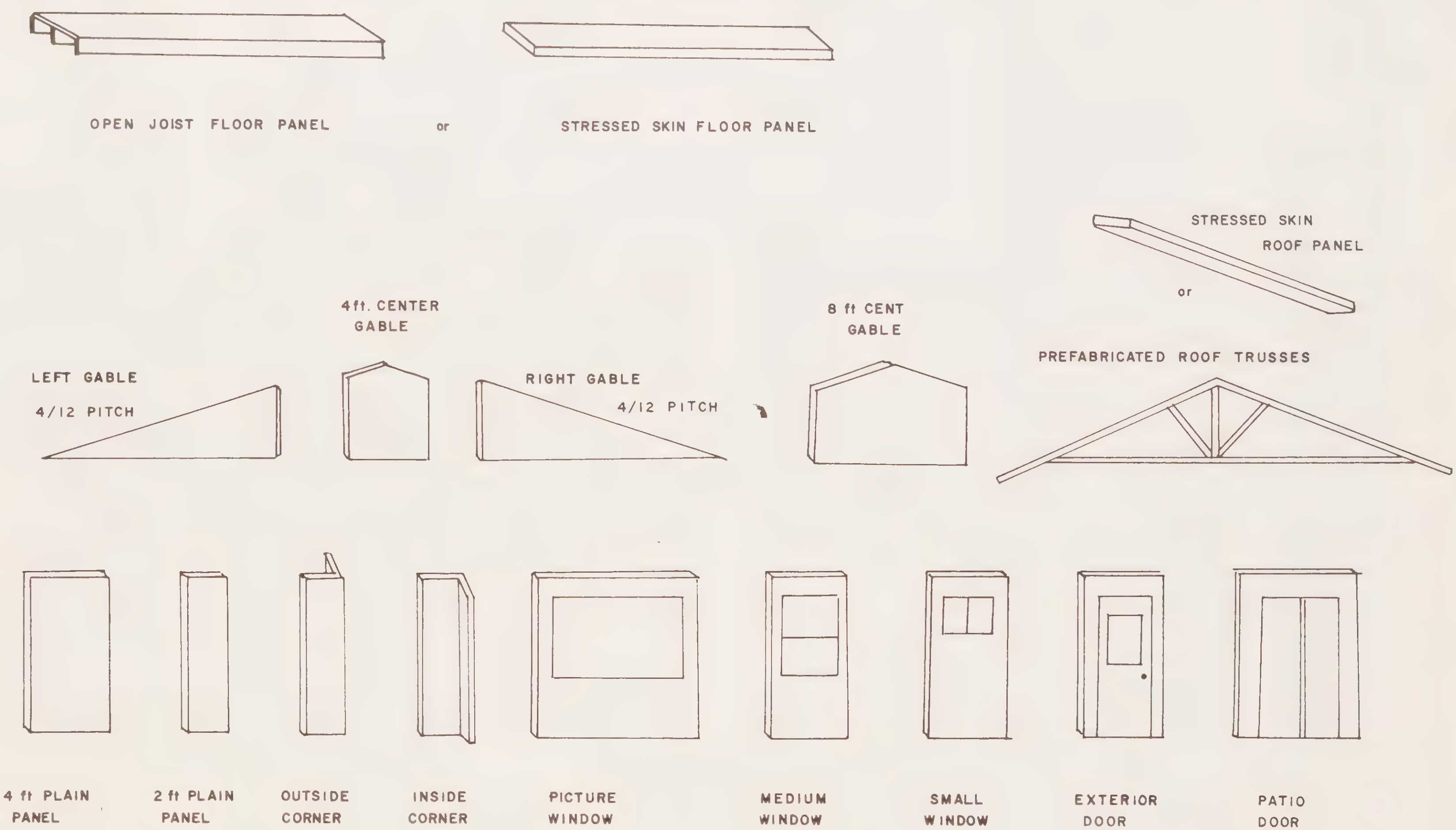


EXHIBIT 3

6.2.1 The Floor Panels

The floor panels are optional to a prefabricated system since it is possible to build conventional joist and plywood floors for houses. The advantage of the floor panel is that they can be preinsulated and prewired to save construction time on the site. They also provide much more rapid construction at the job site than the more tedious system of laying joists, putting down subfloors and insulating them underneath.

The disadvantage of the floor panels is that they require more space than the equivalent joists and subfloors in the transit. While they lend themselves to easy stacking and storage (stressed skin panels for a 1,056 square foot house would only be 4' x 12' x 9"), it does require lift truck capacity to move these units efficiently to the job site. (The implications of this are discussed in subsection 6.5.7.) The skin panels also require careful attention during manufacture to ensure the jigs are precise and the panels are absolutely true. It also requires more attention to ensure the foundation is level and square. These are relatively simple problems to solve once the staff is trained and able to spot areas where problems can arise. Skilled labour would absorb the importance of precision in a very short time and provide startup strength and backup to the unskilled labour.

6.2.2 The Roof System

The roof system can either be the conventional truss and plywood roof or can utilize stressed skin roof panels. The stressed skin roof panels are the preferred way to go because they require less space in transit, can be insulated in advance, and facilitate erection to proceed much more rapidly; they can also be prefinished in the plan to reduce on-site labour.

The disadvantages of a roof panel is that it usually requires a cathedral ceiling and needs a support down the middle of the house. The impact of the cathedral ceiling is felt to be an advantage in many homes because it provides a more roomy atmosphere but it does require that the extra volume of space be heated. It also forces the wiring and heating into the subfloor area, whereas a truss system allows the ducting and wiring to be done in the rafters. This system is usually easier for the sheet metal man or electrician and the insulation is installed over the completed heating and wiring system.

Because of these factors, we would recommend the more labour intensive truss and plywood system at first until the personnel in the plant can devise a better panel system. It also provides more flexible layouts since the exterior walls do not need to support the roof and can be put anywhere.

6.2.3 Gable Ends

Gable ends are fabricated in advance for peak roofs. They lend themselves to both trusses and stressed skin panels but should be made adjustable in lengths for houses from 24' to 32' in width. Exhibit 3 shows the two main gables of 12' each and extensions of 4' and 8' respectively for 28' and 32' spans. Other variations can be added, depending on layouts and floor plans adopted. It should be noted that the gables do not need to be insulated with truss-type roofs but will be with stressed skin panels.

6.2.4 The Wall Panels

The wall panels are the mainstay of the panel houses since they provide the means of erecting the exterior wall quickly. Most panel walls can be erected in two to four hours, if conditions are right, by a four-man crew. Most systems do not require more than adequate supervision with relatively unskilled help.

The main panel systems generally consist of the following:

* a four foot plain panel;
* a half panel or 2' x 8' panel;
* an outside corner;
* an inside corner;
* a picture window in an 8' module;
* a medium size window in a 4' module;
* a small window in a 4' module;
* an exterior door with screen/storm combination;
* (optional) a patio door unit for fancier homes.

It is possible to provide almost any floor plan for a single or two storey house using these modules. While it does not permit fancy variations (since all distances must recognize a two foot minimum module), the module system has a high degree of flexibility and layout strength.

The minor requirements of the two foot module are of little concern to the average house dweller if he can get a workable floor plan.

The wall panels manufactured by one prefabricated housing plant in Kenora, Ontario, follow this system very closely. They provide a prefinished exterior wall surface and insulate the space with urethane foam. This not only provides high insulation value in the walls but backs up the skin and strengthens the panel. All wiring is installed and inspected before the foam is sprayed on. They do not install the interior finish because of building inspection requirements but it is recommended that this extra step be considered for the proposed plant in Hay River.

The use of urethane foam in the walls of the house is recommended, as long as fire safeguards are provided. There is a high degree of concern about the flammability of urethane and styrofoam insulation; for this reason it is recommended that all panels be covered with either metal or a gypsum finish. A sheet of half-inch gypsum board provided a three-quarter hour fire rating while a metal panel can achieve a one hour rating under certain conditions. Tests done by fire underwriters in the U.S. show that by protecting the urethane surface fire spread will be well within normal residential fire requirements.

The use of urethane foam provides the best insulation known. It is two to three times as efficient as the next material, and in extremely cold climates, such as the North, should be the only material considered in spite of its drawbacks. Three inches of urethane foam in the walls of a house will provide the equivalent of six inches of fibreglass batting. The materials also make the house much "tighter" since the panels are solid and no cold air can find its way through, except at the edges.

6.3 Cost of the System

The panel system can be made competitive with almost any method of building construction of conventional single family homes in a market spanning great distances, because it economizes on on-site labour and transportation cost. This section looks at the expected cost of an average 1,050 square foot house that could be built in the proposed plant in Hay River.

The plan assumes a first initial year sales target of approximately 150 units. While it represents a

fairly high percentage of the total market, it appears to be a realistic target. The costing of the units are based on this assumption.

The cost of the house at Hay River is largely made up of imported materials. The total cost of labour and local purchases of materials is quite low because so many items must be brought in from the outside. In addition, we have assumed that the labour input from the plant is reduced because only wall panels will be made the first year rather than floor and ceiling panels to provide a complete unit.

The value of the locally purchased materials in the $4,360 cost of manufactured items (Table 15) will depend on the availability of local lumber. Kiln-dried lumber should be used in the panels and wall partitions because of the need to maintain accurate tolerances. If kiln-dried lumber (or seasoned equivalent) is available in the Territories, it will naturally increase the value of the labour input. Much of the remaining material is plywood or particle board which will have to be imported.

The total cost of a 1,050 square foot house, FOB the Hay River plant is estimated at $15,900 or about $15.00 per square foot. This price however will require sophisticated purchasing practices and shipments in carload quantities but this can be done with proper funding and management control.

The costs of erection and services will depend on location but generally will run $3,000 to $4,000 per unit in the Hay River area. This means a total cost of the house about $20,000, not including the cost of the lot; making it extremely competitive with the most recent prices quoted. Costs of erection in other communities is examined in the subsection 6.5.7.

6.4 Plant Layout

To produce one house per day, we estimate that the plant should have a minimum of 30,000 square feet. Other desirable facilities would include:

* a rail siding capable of unloading two or more cars;
* a truck dock capable of handling three trucks;
* an outside storage area (preferably asphalt) of 20,000 square feet;

Table 15

ESTIMATED COSTS OF A 1050 SQ. FT. MODULAR HOUSE
(f.o.b. Hay River Plant)

COST OF MATERIAL			
Manufactured Items			
Wall Panels	34 @ $45.00 each	$1,530	
Roof Trusses	22 @ $19.55 each	430	
Soffits and Ladders		130	
Windows		600	
Exterior Doors		300	
Interior Doors		500	
Interior Partitions		280	
Kitchen Cabinets		530	
Steps		60	
		$4,360	
Purchased Items			
Joists and Plywood for subfloor		$ 600	
Fascia and Plates		60	
Roof Sheathing		400	
Roofing Shingles and Felt		280	
Insulation		200	
Nails		100	
Underlay for the Floors		200	
Electrical Panel and Wiring		450	
Heating Equipment and Ducting		580	
Plumbing Materials		850	
Oil Tank		200	
Gyproc for Wall Finish		350	
Filler, Tape, Beading for Walls		170	
Floor Tile and Adhesive		420	
Exterior Trim and Eavestrough		160	
Interior Trim		160	
Ceramic Tile for Tub		80	
Paint		200	
Miscellaneous		200	
		$5,660	$10,020
PLANT OVERHEAD AND COSTS			
Management Costs	(sub-section 6.5.3 "b")	$1,000	
Direct Labour Costs	(sub-section 6.5.3 "a")	1,000	
Plant Overhead	(sub-section 6.5.5)	1,000	
Inbound Freight		1,050	
Profit		1,800	$ 5,850
TOTAL COST OF A UNIT (F.O.B. PLANT)			$15,870

* air compressor capacity of 1,000 cfm at 120 psi;
* lighting intensity of 50 foot candles or better;
* sprinklered fire protection system;
* 10,000 KVA power buss and transformer;
* sanitary facilities to a sewer;
* dust and sawdust collection facilities.

All of these facilities are not necessary but are listed as showing desirable requirements.

The plant itself can be of varying configurations; we have shown one that is 150' by 200' or 30,000 square feet. The major components of the plant, as shown in Exhibit 4, consist of:

* an external storage area (preferably paved) for storage of lumber, plywood and other materials. The paving permits lift truck operations year round;
* an internal storage area where materials are held in a temporary bay before moving to the sawing operations;
* a lumber sawing operation where panel, rafter and other wood can be cut to size;
* a cut lumber holding area;
* a panel fabrication line where the 2x4's are assembled to make panels;
* a holding area where the panels can be prewired or plumbed;
* a finishing line where the panels can be spray painted or otherwise finished and the back side of the panel sprayed with urethane foam. The same paint line might also be used for the finishing of kitchen cabinets, window frames or doors;
* a subassembly area where door frames are made, window frames assembled and kitchen cupboards prepared. Depending on the materials, they mights be painted on the paint line;
* roof truss and ladder manufacturing assembly area where the prestressed roof panels could also be made;

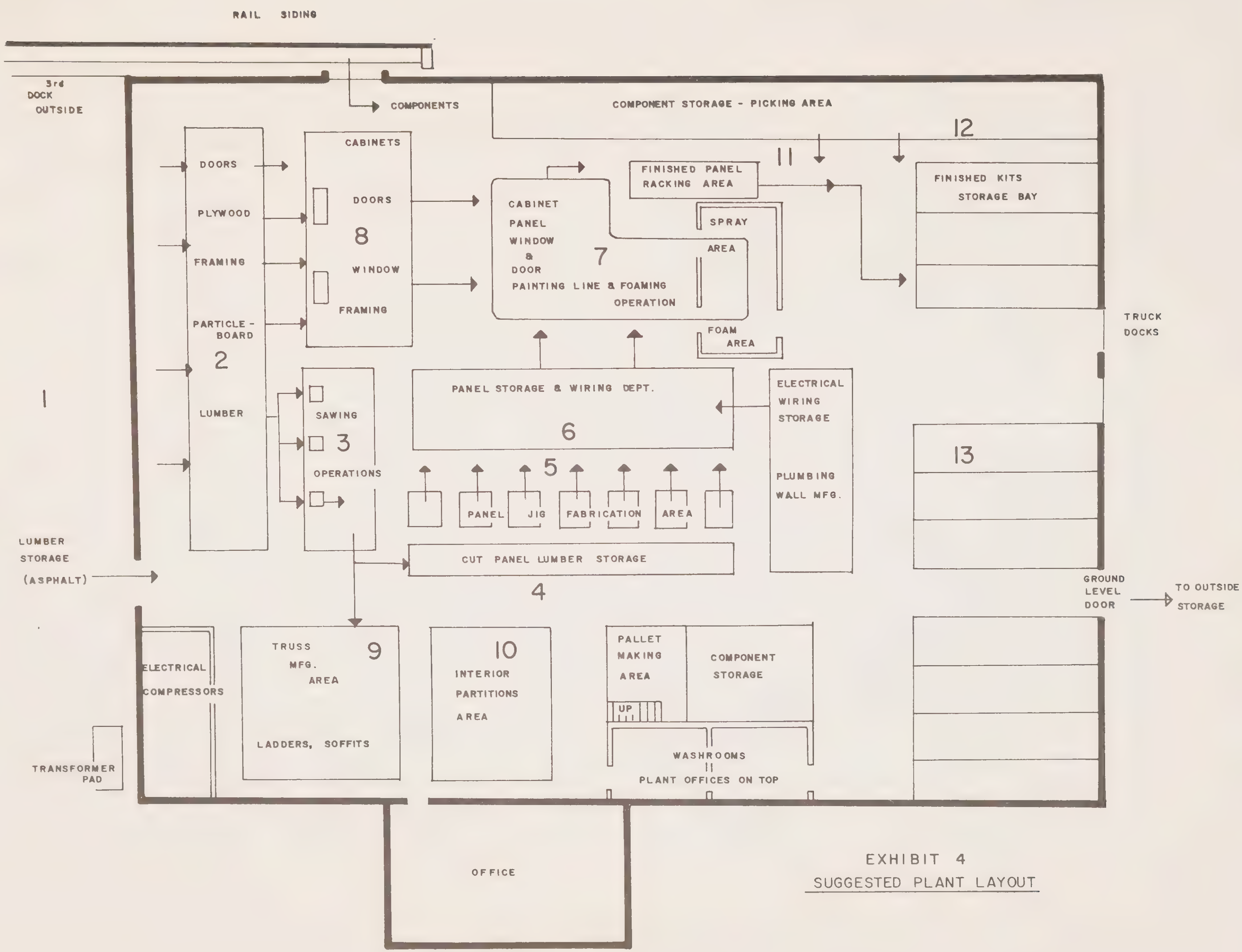


EXHIBIT 4

SUGGESTED PLANT LAYOUT

* interior partitions assembled to a specific layout and wired to a specific plan;
* finished panel racking and storage area where the panels are racked;
* component storage and picking area where goods such as sinks, tubs, toilets, piping, gypsum board can be sorted, stacked and picked to make up a complete area;
* completed kit storage bays where the palletized kits are stored temporarily until complete, checked for accuracy and wrapped for storage. The bays can hold up to 10 units in preparation but completed ones are stored externally.

The plant layout is shown only as a guide to future planning and should be carefully evaluated at the time of the final choice of site and design of the building. It has been made here on the basis that the exterior walls of the panels are to be finished in the plant. It may be easier and cheaper to buy prefinished materials and use them directly rather than finishing them in the plant, at least initially.

The same may be true of the finishing of doors, windows and cabinets. It may be felt that these can be done better by hand or may use prefinished materials. It is our opinion that a finishing line would be beneficial but it could be dispensed with in order to reduce capital cost. For the first year or two, it may be easier and cheaper to bring in prefinished metal, wood or plastic frames made by someone else and use them in the plant rather than to set up a line and train new people. In this way, the quality of the panels, doors and windows could be much higher in the first year of operation than if the whole operation had to learn the fine art of finishing.

We have directed our attention strictly to the building of modular housing units, as opposed to, say, the layout and requirements of the plant for an 800-man camp, since the long term feasibility of the plant must be based on the housing demand rather than taking advantage of short term opportunities. We feel also justified in taking this approach as the plant requirements for both industrial and residential shelter are very similar.

6.5 Operating Plan and Cost Projection

6.5.1 The Operating Plan

The operating plan aims at the building of one house per day during a 150 day season to produce the necessary 150 homes that are projected for the first year. This avoids the operation of the plant in the peak winter season, and in so doing avoids excessive cost heating the plant. In subsequent years, or the result of orders from the Applicant for camps, it will become necessary to produce on a year round basis and, in time, on a two shift basis during certain periods of the year.

For the purpose of this feasibility study and to keep our projections conservative, the operating plan calls for the plant to be in production from approximately mid-March to mid-November to produce 150 units in 150 working days. It is planned to produce and store the units to be able to ship them to the various communities along the Mackenzie River from mid-June through to September. The ramining units would then be utilized locally or could be trucked to the sites that have been prepared during the summer. Because the units can be erected quickly the construction could be stretched into December and the final finishing done at a more leisurely pace during the cold season within the shelter of the units.

The plan could just as easily have a double shift operating for 75 days producing two houses per day or a variation of one and two shift operations over a longer 90 to 120 day period. The single shift variation was chosen since it entails the longest operating time and maximizes the working capital requirements. The assumption is that if the plan is made for the worst conditions then the other options will be attainable also.

The plan also requires that the entire house, panels, doors, trusses, etc. be inventoried during the initial production season and that the purchased materials be brought in and assembled as part of the required kit. This would include materials such as floor tile, shingles, insulation, sheeting, gypsum board, etc. as well as the plumbing and electrical supplies. This would increase the total value of materials in inventory and the overall cash requirements; it also increases the storage space. As might be expected, this creates the "maximum" situation for space, cash flow and inventory, so that any other siutation will be less demanding. While this may not be

the most realistic model in terms of efficient operation, it does create the most serious picture in terms of requirements.

In the production plan, we have made the assumption that one-half of the units are to be barged to the more northern points and that they will be sent off in two shipments:

* first shipment of 50 units will leave mid-June;
* second shipment of 25 units will leave mid-July.

This will enable the construction crews to take advantage of the brief season to erect the shells.

The remaining 75 units are assumed to be within a short truck or barge haul of the plant and that they will be shipped at the rate of five or six per week until mid-October. This assumes foundations can be put in during the summer and the houses erected in the fall weather. The finishing operations can proceed through until December or January, as necessary within the shelter of the housing units.

6.5.2 Capital Cost of Plant and Equipment

The cost of building and erecting a plant to produce the prefabricated houses is estimated at $450,000. This is broken down as follows:

* Serviced land - 5 acres @ $4,800	$ 24,000
* Bare plant building 30,000 sq.ft. @ $11/sq.ft.	330,000
* Rail facilities including loading docks	10,000
* Office addition 2,000 sq.ft. @ $15/sq.ft.	30,000
* Outside paving 20,000 sq.ft. @ $.50/sq. ft.	10,000
* Extra fire protection	20,000
* Truck loading docks	15,000
* Lighting and electrical distribution	10,000
COST OF PLANT AND LAND	$449,000

In addition to the plant itself, the equipment required for operation is expected to cost upwards to

$150,000 (depending on availability of funds) and this is broken as follows (it should be noted that this also includes equipment for erection and transportation crews, not only in-plant equipment):

(a) *In-Plant Equipment*

* Double Cut-off Saw	$ 12,000
* Panel Saw	6,000
* Two Radial Arm Saws	6,000
* Conveyors	16,000
* Table Saws (2)	2,000
* Power Nailers/Tools	5,000
* Jig and Layout Tables	5,000
* Spray Guns, Fans and Dryoff Ovens	18,000
* Truss Press	10,000
* Compressors and Air System	8,000
* Miscellaneous Tools, Benches, etc.	4,000
* Office Furniture	7,000
* In-plant Offices and Desks	3,000
* Two Lift Trucks (1 large, 1 small)	18,000
Total	$120,000

(b) *Out-of-Plant Equipment*

* Scaffolding	$ 5,000
* On-road Lift Truck	15,000
* On-site Power Equipment	10,000
Total	$ 30,000
TOTAL COST OF EQUIPMENT	$150,000

This would bring the total capital cost of the plant to about $600,000.

The equipment in the plant will provide a first class manufacturing facility with a high degree of efficiency. This cost could be reduced by the elimination of some of the "frills" such as the double cut-off saw but at an increased cost to the final cost of the product. The equipment budget is satisfactory to allow modifying the setup to utilize almost any kind of finishing material or to finish the exterior of a wood, plywood or hardboard material.

A quick breakdown of the equipment is listed in order to outline the purpose and the end-use:

* The cut-off saw would provide the efficiency of

cutting timber to the required lengths for fabrication into panels.

* The panel saw is recommended for the cutting of plywood panels, soffits and particleboard for cabinets, etc.
* The radial arm saws find general purpose usage for frames, cabinets, trusses and low volume work.
* The table saws are beneficial for long cutting situations as well as backup for the radial arm saws.
* The power nailers and similar hand tools provide efficiency in assembling and trimming the panels.
* Jig and layout tables are required to hold the tolerances of panels to close variations.
* Spray guns and exhaust fans are required for finishing the exterior facing of the panels. Other uses include finishing doors, windows, cabinets, etc.
* A truss press is included in order to make a compact truss system if roof panels are not utilized in the initial years.
* Compressors and an air system are required to provide compressed air throughout the plant.
* Miscellaneous tools for maintenance, electrical, plumbing and similar work are included in this figure.
* Office furniture (self-explanatory).
* In-plant offices and desks include chairs and tables for a small cafeteria.
* Two lift trucks are felt to be necessary——a large 8,000 lb. machine and a smaller 2,000 to 3,000 lb. one for lighter work.

In the out-of-plant equipment category, the crews in the field are assumed to be provided with the following equipment:

* scaffolding for ease of finishing off eavestroughs, etc.;
* a large rubber-wheeled lift truck that can be used to load and unload the barges and which will make the trip up and down the river, increasing

the efficiency and safe handling of the components at each community. (This may be an "optional" requirement and is discussed in the section on erection planning.);

* On-site power equipment includes small motor-driven compressors for power air guns and small generators for power saws. Both of these items can increase the efficiency of erection by a major factor.

6.5.3 Plant Operating Costs

Hourly Staff - The estimated personnel required for hourly staff to manufacture one house per day is shown in Table 16. The table breaks out the job and the estimated hourly rate (the hourly rate used should ensure a competent and efficient work force).

Table 16

Hourly Personnel Required in the Plant

Operation	No. of People	Average Hourly Rate	Total Per Hour
	#	$	$
Wood Panel Shop	3	5.50	16.50
Main Panel Line	5	4.25	21.25
Panel Finishing Operation	2	5.75	11.50
Window Assembly Operation	2	5.40	10.80
Door Assembly Operation	2	5.30	10.60
Truss Assembly Operation	2	5.00	10.00
Cabinet Assembly Operation	1	5.50	5.50
Order Picking and Material Handling	2	4.50	9.00
Receiving/Quality Control	1	4.50	4.50
Plumbing Line (Part-time)	1	4.50	4.50
Shipping	3	4.00	12.00
Maintenance	1	7.25	7.25
Janitorial (Part-time)	1	3.00	3.00
Totals	26		126.40

Average daily payroll—8 x $126.40 = $1,011.20/day
Annual Payroll @ 150 days = $151,680

The staffing may be higher than required but does make allowance for the need to have back-up staff because of absenteeism, job turnover, etc. A breakdown of activities is as follows:

* The wood panel shop cuts all the wood for the trusses, panels, beams, steps and interior partitions. Since an average house of about 1,000 square feet needs about 34 panels and 22 trusses, the staff of three should be able to meet this load with ease with the equipment shown.

* The main panel lines assembles the panels, wires and insulates the panels, using five different people.

* The panel finishing operation assumes one person to spray and the second to check the quality, and to alternate with the other.

* Since each house only requires seven to eight windows, a crew of two is needed to cut the frames, insert the vinyl sliders, assemble the glass and prime the exterior.

* The door operation requires two exterior and up to ten interior doors to be made up and assembled. This should be a fairly easy task and it is expected that the two persons will be used on other tasks as well.

* Truss assembly operation has two people allocated for the job of producing trusses and interior partitions. Trusses for one house should take half a day and the interior partitions the remainder of the day.

* Only one cabinet maker is shown—the door assemblers can assist in this task when necessary.

* Two people are allocated to order picking and material handling—preferably with the small lift truck.

* Receiving has one person allocated to the equally important job of checking the quality of products on the line. This ensures the incoming material is correct in count and quality; since it frequently is not a major job, time will be available for checking quality throughout the plant. (The lift truck drivers do the physical unloading.)

* Making up of plumbing walls is only a part-time job and is shown at half the expected plumber's

rate. This includes time to make up a unit and pressure test.

* Three people are allocated to shipping and more may be needed at "peak" periods when barges are leaving.

* One person is allocated to maintenance of the plant buildings and equipment.

* A part-time janitor is added to keep the plant and office clean.

As such, 26 people are required on the hourly staff for an average daily payroll of $1,011.20 per day. This figure is rounded off in an earlier section to $1,000 to indicate the approximate labour cost of a housing unit.

Managerial Staff - The managerial staff should be kept as low as possible and as such we have outlined jobs for a maximum of nine people. The proposed staff and their salaries are shown in Table 17.

Table 17

Middle and Senior Management

Position	Annual Salary
	$
President	30,000
Operations Manager	20,000
Construction Manager	20,000
Sales Manager	20,000
Accountant/Controller	17,000
Purchasing Agent	15,000
Design/Draftsman	15,000
Payroll/Bookkeeper	12,000
Typist	8,000
Total	157,000

The job requires fairly versatile people but our involvement in this area indicates that such people are available. Reasonably attractive salaries are shown in order to attract competent help. The positions are largely self-explanatory. The major point in hiring staff is to find people who have experience in the field,

especially the top three managers. There are too many problems to be faced in getting a project of this magnitude and risk off the ground not to have to hire and work with well-intentioned amateurs. Beware the person who feels they know the housing market and its problems because they built their own house and/or worked for a stick built contractor. What we are proposing is a factory operation and not on-site construction; the requirements of the two are quite different. There are a lot of prefabricated housing firms in the business and there are many executives available with experience. One should hire as many people with experience as possible and screen carefully.

6.5.4 Availability of Labour

The 1973 population of Hay River is estimated to be about 3,300 of which 275 are classified as Treaty Indians. Of the 1971 census population of 3,004, approximately 905 males and 839 females, for a total of 1,744 persons, were in the working age category (15-64 years of age) of which, in turn, 135 (75 males and 60 females) were classified as Treaty Indians.

There is very little if any unemployment (i.e. of employable persons) among the non-Indian population in Hay River and considerable unemployment and/or under-employment among the Indian population. As such, by necessity most of the labour requirements for the proposed plant would need to come from the male and female working age population of the Hay River Band.

There should be little difficulty recruiting the 26 persons needed in the plant from the ranks of the Band especially since many of the operations of the proposed plant are suitable for females. Also, some of the men have already received some basic training in connection with the Work Arctic Project. However, on the basis of preliminary findings, it appears that most of the skilled and supervisory positions in the plant would need to be hired from outside; the same applies to the managerial and administrative positions.

Consequently the ten-year management contract with the Investor/Manager (subsection 8.2 "Sources of Funds" and section 9 "Blueprint for Action") would have to specify the type and rate of vertical mobility (i.e. advancement through a well defined on-the-job training program) and cost and source of funds for such an educational program. The objective of the training program would be to enable Indian

personnel to staff most, if not all, of the positions in the proposed housing plant in Hay River during the ten-year period.

6.5.5 Fixed and Overhead Costs

A breakdown of fixed and overhead costs is shown in Table 18.

Table 18

Summary of Fixed and Overhead Costs

Expense	Cost
	$
Fringe Benefits for Employees	27,000
Travel Expense (excl. construction supervisor)	15,000
Heat, Power and Light	35,000
Plant Supplies	15,000
Office Supplies	10,000
Plant and Office Maintenance	6,000
Accounting and Legal	5,000
Truck Operating (local only)	10,000
Advertising and Literature	15,000
Insurance	14,000
Total Plant Overhead Costs	152,000

These are very difficult to estimate in most situations because of the variable factors involved but we have estimated them to reflect the following:

* Fringe benefits include sickness, accident, compensation, and similar benefits. This has been set at 9% of payroll.

* Travel expense allows a limited number of visits to suppliers, communities in the Territories and to points south by managerial personnel. This budget does not include the construction supervisor or the erection crews who should be charged to another budget.

* Heat, power and light are extremely difficult to predict because of the recent inflation but this is set quite high in order to be on the conservative side. The operation is not a great

consumer of electricity (if fluorescent lighting is used) and the shutdown at the peak cold period of the year should save considerable amounts of fuel. Whether natural gas will be a benefit will depend on fuel oil costs and the gate price of gas at the time.

* Plant supplies include towels, rags, thinner, nails, saw blades and similar products that are consumed in the manufacturing process but are not part of the cost.

* Office supplies (self-explanatory).

* Plant and office maintenance covers light bulbs, repairs, repainting and similar costs.

* Accounting and legal is budgeted at $5,000 per year (not including the first year startup costs) as cost of both should be relatively small once operations have stabilized.

* Truck operations include the local operating of moving material to the docks, picking up materials locally, etc.

* Small budget is included for literature, price lists and similar material.

* Insurance on a well protected plant should be low, but this figure will depend on the plant construction, the fire safeguards and many other factors that can be evaluated only by the insurance companies at the time. This figure is a rough estimate based on similar plants in Alberta, but increased slightly to reflect higher insurance costs in N.W.T.

6.5.6 Summary of Capital and Operating Costs

(a) *Capital Cost of the Proposed Plant*

* Cost of Plant and Land ($449,999)	$450,000
* Cost of Equipment	150,000
Total	$600,000

(b) *Plant Operating Costs*

* Hourly Plant Labour
  $151,680 per annum or about $1,000/unit
* Middle and Senior Management
  $157,000 per annum or about $1,000/unit
* Fixed and Overhead Costs
  $152,000 per annum or about $1,000/unit

6.5.7 Economics of Shipping and Erection

The cost of shipping, and erecting the houses on-site remains a major factor in the success of the total operation. Unless the units can be put into the community in a safe, economical manner and one in which the quality is maintained, the long term success of the project will be limited.

The project assumes that foundations can be installed by local people and that supervision is required in each community for the erection of the units. Many of the self-locking units install very easily and can be put up with virtually unskilled labour. Supervision would be preferable, and a special training course on how to install units properly might be set up under Canada Manpower or similar training schemes.

An average prefabricated panel house erects very quickly—most firms claim less than two days from a bare foundation, but finishing the interiors does take longer. An "average" and "high" range for erection costs, using fairly typical Territorial labour costs is shown in Table 19 for a standard 1,050 square foot house. This assumes a well-trained crew working with reasonable efficiency. A new or less skilled crew could take 20 to 50 per cent longer on their first unit.

From this assumption it is possible to put together a generalized cost of erecting houses in various communities in the Territories (Table 20). These costs indicate what potential costs could be using an efficient and full-time erection crew. It should be noted that costs will probably be somewhat higher in the first year until the most efficient plan evolves with experience and training.

Table 19

Assumptions of Erection Labour Costs for a Typical House Built at the Proposed Hay River Plant

Tradesman	No. Req'd	Average Hourly Rate	Total Hours Man Req. Average	Total Hours Man Req. High	Total Cost Average	Total Cost High
		$			$	$
Carpenter Foreman	1	10.00	64	80	640	800
Assistant Carpenter	1	7.50	64	80	480	600
Labourer	2	5.00	128	160	640	800
Electrician	1	15.00	20	24	300	360
Plumber	1	12.00	16	24	192	288
Painter	1	8.00	40	48	320	384
Drywall	1	10.00	20	24	200	200
Totals			352	440	2,772	3,432

There are basically nine costs that influence the price of a house in various communities in the Territories. These are:

(a) *base cost* of the house FOB the plant in Hay River. This will be the same for any community;

(b) *barge cost* for the moving of houses to the different communities on the assumption that each house weighs 30,000 lbs. and moves at commercial rates;

(c) *transfer cost* is the cost of moving the house from the plant to the barge and from the barge to the site. This is not an actual cost but one that probably could be attained with a large lift truck that would move north with the barges and transfer the houses from barge to site;

(d) *erection cost* is the estimated cost of a well-trained crew that would put up the unit. As noted earlier, prefabricated houses should be assembled differently from regular houses and personnel should be trained in the techniques.

GENERALIZED COST OF HOUSES ERECTED IN VARIOUS COMMUNITIES IN THE NORTHWEST TERRITORIES ($)

By Barge	Base Price	Barge Cost	Transfer Cost	Erection Cost	Travel Cost	Utility Cost	Supervision & Travel	Contingency	Foundation Cost	Total Cost	Average $/sq.ft.
	$	$	$	$	$	$	$	$	$	$	$
Hay River	15,900	-	40	3,000	-	3,000	500	500	1,000	23,840	22.80
Fort Resolution	15,900	246	100	3,000	1,900	3,000	500	500	1,000	27,146	25.85
Yellowknife	15,900	294	100	3,000	2,000	3,000	500	500	1,000	27,294	25.99
Fort Simpson	15,900	390	100	3,100	2,400	3,500	500	500	2,000	28,390	27.03
Wrigley	15,900	468	100	3,100	2,600	3,500	500	500	2,000	28,668	27.30
Fort Norman	15,900	507	100	3,200	3,000	4,000	500	500	2,000	29,707	28.29
Norman Wells	15,900	507	100	3,200	3,000	4,000	500	500	2,000	29,707	28.29
Ft. Good Hope	15,900	612	100	3,300	3,000	4,500	500	500	2,000	30,412	28.96
Arctic Red River	15,900	741	100	3,300	3,200	4,500	500	500	2,000	30,741	29.28
Inuvik	15,900	780	100	3,500	3,500	4,500	500	500	2,000	31,280	29.79
Tuktoyaktuk	15,900	879	100	3,500	3,500	4,500	500	500	2,000	31,379	29.88

Assumptions:

1. Total house weight is approximately 30,000 lbs.
2. Barge costs are 1974 rates.
3. Transfer cost is the loading and unloading of barge plus transfer to site.
4. Erection cost assumes increasing rates for skilled labour in more remote areas.
5. Travel cost assumes estimated cost for one crew for 10 days.
6. Utility cost is estimated cost for connection to utilidor, or equivalent.

Erection costs would be expected to rise as the work was done further north because conditions are less favourable and presumably people would not necessarily be as well trained;

(e) *travel cost* is the cost of moving the crews of trained carpenters, electricians and plumbers north and paying for their transportation, lodging and food. The allowances shown are fairly generous and should be quite adequate. The plan would suggest that one of the better ways to handle travel costs is to have the foreman dropped off to supervise the erection of the first few units, then move to community #2 further north. The second foreman would handle community #3 and the third foreman would get community #5. They would then leap frog up the river.

The local crews would continue to erect the houses after the foremen left and install the interior partitions. The electrical plumbing, drywall and painters would follow along as the work progressed to bring the units to completion;

(f) *utility cost* would be the cost of connecting the house to a utility system for water and sewer. The specific costs per house will vary widely depending on location within the community but a rough average cost is shown to indicate the order of magnitude;

(g) *supervision and travel* - an arbitrary $500 is allocated to each house for the main construction supervisor's travel expenses. This will allow up to $75,000 for him and his assistants as well, a reasonable budget for training personnel in the more northern communities;

(h) *contingency* - $500 is allowed for contingencies that may arise. Like the supervisor's travel time, it is an arbitrary figure and allows for estimating errors; and

(i) *foundation cost* - the cost of a foundation will also vary widely in the northern communities. We have allowed $1,000 for the three southern communities but location will have a major influence on total cost. The $2,000 for northern communities is a rough estimate and will depend on location and materials.

It can be seen that distance and travel have a major impact on the cost of a new house. The same house in Hay River, at $22.80 per sq. ft., will cost nearly $30.00 per square foot in Tuktoyaktuk. Even under the assumed cost conditions the unit cost of the houses is below the cost of comparable ready-built units from the South and provides both employment and resource utilization in the Territories.

The cost of building houses in the North can probably be reduced with improved technology. The use of self-contained sewer and water systems that can be skid-mounted and used by one to ten houses could be a significant area for cost savings since this is where the use of skilled labour can be minimized, and hook-up systems reduced or eliminated. Many systems are reaching the market now and will likely be fully acceptable within a few years.

Foundations can probably be simplified by a northern firm looking for improved methods. There is no reason why foundations in permafrost areas could not be "bolt-together" insulated panels that become part of the floor system. This too would make major cost savings for erection.

Finally, the development of local labour that can put up the buildings without the high travel costs for supervision and special skills can only be developed by a firm based in the Territories. A firm from the South will always have its local market to fall back on and will regard the Territories as a marginal market. Unless a southern firm can develop the volume in the N.W.T. it cannot afford to develop the trained staff. A northern firm on the other hand *must* develop the local personnel to survive and, in time, to prosper.

Eventually the cost of moving houses north might justify the construction of a special barge for moving the prefabricated panels and materials north. The size of panels could be increased greatly by the use of power lifting devices, mechanized transfer equipment and other specialty bolt-together mechanisms. The panels outlined earlier are scaled for use in trucks and the need to have people lift them. Since most of the communities in the Northwest Territories are along the Mackenzie River the panels could easily be barged north with special equipment and delivered to site.

There is no reason (other than equipment) why

entire walls cannot eventually be built that are plumbed, wired, finished inside and out and be complete with doors and windows. The whole house could be 10 to 15 parts that bolt or clamp together on-site for speedy erection. These would be units specially built for the Territories and would be complete with services. This, presumably, would be an eventual goal for a prefabricated plant in the Territories.

7. CORPORATE OWNERSHIP AND STRUCTURE

The success of an enterprise is very much dependent on the soundness of its corporate structure and competence and commitment of its management team; very much supportive to:

* Market potential;
* Product features;
* Manufacturing efficiency;
* Adequate financing.

In light of the sad experience of government operated/supported projects (e.g. saw mills) in the past it is not recommended to launch the modular housing plant using such an approach. The disadvantages are many, to name a few:

* other than the government there is no personal and *financial* commitment on the part of the owner/operator of the enterprise;

* irrespective of the quality of the manager of the enterprise he can only act as an employee, lacking that extra effort (the product of personal and financial commitment) that is critical to the success of a new venture especially in slow growth and/or disadvantaged geographic regions;

* the project being in the hands of government employees suffers the usual "state ownership" syndromes.

As an alternative, one or more of the existing prefabricated housing companies could be approached with a view of establishing a branch plant in Hay River. This approach would have the following advantages:

* existing corporate strength and proven management competence;
* an acceptable product and manufacturing expertise;
* financial strength.

On the negative side.....

* it may be difficult to attract an existing manufacturer since many of them are already supplying the Territories from plants in Alberta and Saskatchewan. The limited size of the market may not be sufficiently attractive to justify the cost and management time and effort to build a branch plant in the Territories unless there was a healthy government equity and guarantees of loan participation.

* attracting an existing manufacturer or a venture capital concern from the South would preclude northern ownership and limit the advantages to employment to the community and revenue to the Territories. This argument becomes even stronger if the government would have to support the project financially.

* this approach would not facilitate nor encourage the growth of entrepreneurship in the Territories, especially on the part of the native people.

In order to reinforce the strengths of the foregoing arguments and minimize on their weaknesses we propose the following scenario and extent of government participation (since Hay River is the recommended site of the proposed plant, the existence of a sizeable native community with a potentially employable work force should receive due consideration in the proposed Corporate ownership).

(a) Incorporate "Territorial Modular Homes Ltd." 51% owned by the Hay River Band and 49% by the Investor/Operator of the plant.

(b) Insist on dollar for dollar participation with the potential Operator of the plant in the equity capital required to launch the venture. It is suggested that the individual investment should be in the $50,000 to $100,000 range for a total paid up capital of between $100,000 to $200,000.

(c) Provide a loan via the Indian Economic Development Fund.

(d) Insist on a joint responsibility for a line of credit (working capital) at the bank.

(e) Provide the Operator with a ten year management contract at the end of which the Band would have the option to buy out the operator at ten times earnings after taxes or the appraised net value of the plant, whichever is greater.

The management contract should be framed in such a way as to both enable the Operator to run an efficient plant as well as prepare, over the ten-year period, the 51% owners of the plant, i.e. native people, to take over the management of the plant.

(f) Endeavour to support the plant, at competitive costs, to the extent of 150,000 square feet of housing (shelter) space per annum.

Under the above outlined corporate ownership it is proposed that the board be composed of five Directors, namely:

* two from the Band, one of whom would be the Regional Superintendent of Economic Development, Indian and Eskimo Affairs, remaining on the Board until such time as the Department's guarantees cease or the Band buys the other 49% and assumes full responsibility for the obligations of the business.

* two from the Investor/Manager for the duration of the management contract;

* the Managing Director of the N.W.T. Housing Corporation.

One of the major functions of the Board would be to review and approve the annual corporate plan (marketing, operations and financial) of the Company and to meet quarterly to discuss the Company's performance against the plan.

In order to provide the Company with the necessary policy guidance, it is also suggested that an Executive Committee be formed composed of the President (who would also be a Board member), Managing Director of the N.W.T.

Housing Corporation and the Operations, Marketing and Financial Managers of the Company. The Committee would meet monthly to review past and current months performance and approve next month's plans and budgets. The President of the Company, who would also be the Chairman of the Executive Committee, would submit quarterly reports of the work of the Committee to the Board of Directors.

The Corporate structure of the Company would appear as shown in Exhibit 5.

8. FINANCIAL VIABILITY AND SOURCES OF FUNDS

8.1 Financial Viability

8.1.1 Working Capital Requirements

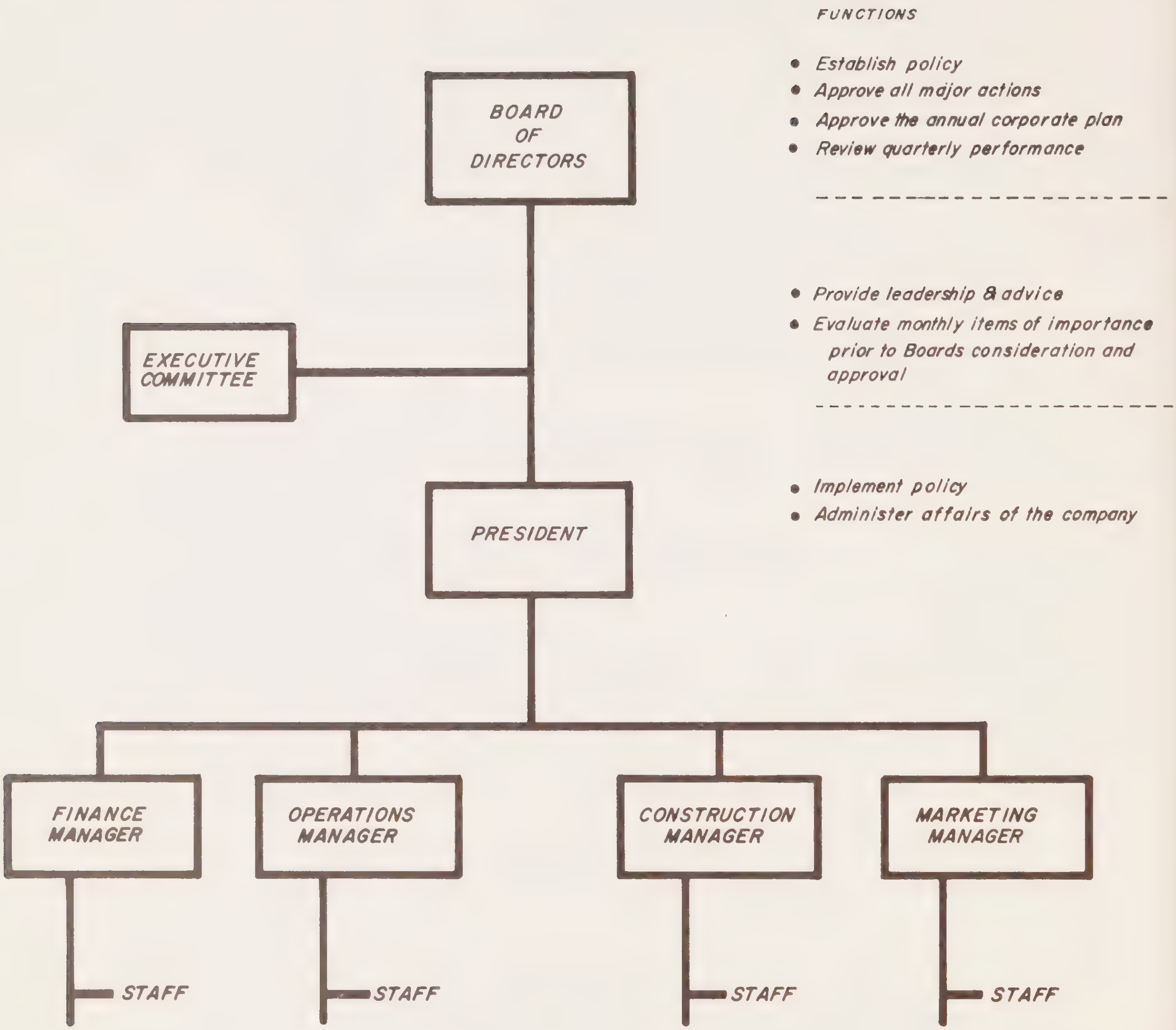
(a) *High Working Capital Requirement - Model 1*

The day to day operation of the plant is considered to be a direct function of cash flow as is the total cost of the materials and components shown in the cost breakdown of a typical unit. In practice, the manufactured items should not be completely charged to cost, but for our purpose it is assumed that the units will be produced and inventoried on a regular basis. Thus a "produced" item is assumed to cost as follows:

* Manufactured items	$4,360
* Purchased items	5,660
* Direct labour	1,000
* Inbound Freight	1,050
Total Cost	$12,070

The purchased components probably should not be bought until a few weeks before the houses are to be shipped, as they could be unitized in a separate part of the package. This would greatly reduce the cash flow requirements for the first few months while the inventory for the houses being shipped along the Mackenzie River up to Inuvik or beyond is accumulated. We have not used this model but have assumed that the components are purchased and packed as part of the complete kit. This maximizes the cash requirements to show the magnitude of capital required to inventory the 75 units.

EXHIBIT 5



corporate structure

Under such assumed conditions, Table 21 shows that the maximum loss occurs in Week 11 when the company has a paper loss of $813,850. In reality a good portion of this amount is merchandise in inventory and could have been shown as such, with the operating loss kept considerably lower. (This method assumes materials put into a kit are charged to production at the time they are packed.)

In addition there will be cash and raw inventory requirements of approximately $100,000. It will be difficult to keep below this figure because of the need to order materials in carload or semi-carload quantities in order to gain a good price and keep inbound freight costs within budget. It is difficult to keep inventory lower than this anticipated level without running into out-of-stock problems.

As shown in Table 21 the maximum cash flow requirements for working capital, operating losses and inventory hits a peak of $913,850 in Week 11 and is progressively reduced in subsequent weeks.

(b) *Low Working Capital Requirements - Model 2*

The ability of a new firm to find nearly $1.5 million in cash and/or credit in its initial year of operation could be difficult in times such as these when credit is extremely tight. A second model looks at the working capital requirements under the assumption that the first 75 houses are sold when they are completed. At that point, the Territorial and/or Federal Government takes ownership of them for their normal requirements and contracts the company or some other group to erect them.

The effect of selling the units as they are produced is shown in Table 22. This only shows the effect on the cash flow for the first 15 weeks but it can be seen that the maximum requirements are only $135,700 compared to the $913,850 under the other plan. This could have a major influence on both the survival and profitability of the company in its first year of operation.

The cost of the bank line of credit is not prohibitive (as will be shown in the next section), but finding a lending institution to put up the capital without an adequate guarantee might be difficult.

Table 21

Weekly Pro Forma Profit and Loss Statement and Cash Flow Analysis - Model #1

Week #	Houses Built	Houses in Inv.	Houses Sold	Revenue @ $15,870	Start-up Expenses	Plant and Management	Direct Costs	Total Costs	Profit(Loss)	Cumulative Profit(Loss)	Inventory and Working Capital Buildup	Total Cumulative Cash Flow
				$	$	$	$	$	$	$	$	$
March												
Week 1	5	5	-	-	40,000	10,000	60,350	110,350	(110,350)	(110,350)	50,000	(160,350)
Week 2	5	10	-	-	-	10,000	60,350	70,350	(70,350)	(180,700)	20,000	(250,700)
April												
Week 3	5	15	-	-	-	10,000	60,350	70,350	(70,350)	(251,050)	20,000	(341,050)
Week 4	5	20	-	-	-	10,000	60,350	70,350	(70,350)	(321,400)	10,000	(421,400)
Week 5	5	25	-	-	-	10,000	60,350	70,350	(70,350)	(391,750)	-	(491,750)
Week 6	5	30	-	-	-	10,000	60,350	70,350	(70,350)	(426,100)	-	(562,100)
May												
Week 7	5	35	-	-	-	10,000	60,350	70,350	(70,350)	(532,450)	-	(632,450)
Week 8	5	40	-	-	-	10,000	60,350	70,350	(70,350)	(602,800)	-	(702,800)
Week 9	5	45	-	-	-	10,000	60,350	70,350	(70,350)	(673,150)	-	(773,150)
Week 10	5	50	-	-	-	10,000	60,350	70,350	(70,350)	(743,500)	-	(843,500)
June												
Week 11	5	55	-	-	-	10,000	60,350	70,350	(70,350)	(813,850)	-	(913,850)
Week 12	5	10	50	793,500	-	10,000	60,350	70,350	723,150	(90,700)	-	(190,700)
Week 13	5	15	-	-	-	10,000	60,350	70,350	(70,350)	(161,050)	-	(261,050)
Week 14	5	20	-	-	-	10,000	60,350	70,350	(70,350)	(231,400)	-	(331,400)
July												
Week 15	5	25	-	-	-	10,000	60,350	70,350	(70,350)	(301,750)	-	(401,750)
Week 16	5	5	25	396,750	-	10,000	60,350	70,350	326,400	24,650	-	(75,350)
Week 17	5	4	6	95,220	-	10,000	60,350	70,350	24,870	49,530	-	(50,480)
Week 18	5	3	6	95,220	-	10,000	60,350	70,350	24,870	74,390	-	(25,610)
Week 19	5	2	6	95,220	-	10,000	60,350	70,350	24,870	99,260	-	(740)
August												
Week 20	5	2	5	79,350	-	10,000	60,350	70,350	9,000	108,260	-	8,250
Week 21	5	2	5	79,350	-	10,000	60,350	70,350	9,000	117,260	-	17,260
Week 22	5	2	5	79,350	-	10,000	60,350	70,350	9,000	126,260	-	26,260
Week 23				79,350				70,350	9,000	135,260		35,260
Week 24				79,350				70,350	9,000	144,260		44,260
September												
Week 25				79,350				70,350	9,000	153,260		53,260
Week 26				79,350				70,350	9,000	162,260		62,260
Week 27				79,350				70,350	9,000	171,260		71,260
Week 28				79,350				70,350	9,000	80,260		80,260
October												
Week 29				79,350				70,350	9,000	189,260		89,260
Week 30				79,350				70,350	9,000	198,260		98,260

Table 22

Weekly Pro Forma Profit and Loss Statement and Cash Flow Analysis - Model #2

Week #	Houses Sold	Houses Built	Revenue @ $15,875 $	Start-up Expenses $	Plant and Management $	Direct Costs $	Total Costs $	Profit(Loss) $	Cumulative Profit(Loss) $	Inventory and Working Capital Buildup $	Total Cumulative Cash Flow $
Week 1	3	5	47,650	40,000	10,000	60,350	110,350	(62,700)	(62,700)	50,000	(112,700)
Week 2	5	5	79,350	-	10,000	60,350	70,350	9,000	(53,700)	20,000	(123,700)
Week 3	5	5	79,350	-	10,000	60,350	70,350	9,000	(44,700)	20,000	(134,700)
Week 4	5	5	79,350	-	10,000	60,350	70,350	9,000	(35,700)	10,000	(135,700)
Week 5	5	5	79,350	-	10,000	60,350	70,350	9,000	(26,700)	-	(126,700)
Week 6	5	5	79,350	-	10,000	60,350	70,350	9,000	(17,700	-	(117,700)
Week 7	5	5	79,350	-	10,000	60,350	70,350	9,000	(8,700)	-	(108,700)
Week 8	5	5	79,350	-	10,000	60,350	70,350	9,000	300	-	(99,700)
Week 9	5	5	79,350	-	10,000	60,350	70,350	9,000	9,300	-	(90,700)
Week 10	5	5	79,350	-	10,000	60,350	70,350	9,000	18,300	-	(81,700)
Week 11	5	5	79,350	-	10,000	60,350	70,350	9,000	27,300	-	(72,700)
Week 12	5	5	79,350	-	10,000	60,350	70,350	9,000	36,300	-	(63,700)
Week 13	5	5	79,350	-	10,000	60,350	70,350	9,000	45,300	-	(54,700)
Week 14	5	5	79,350	-	10,000	60,350	70,350	9,000	54,300	-	(45,700)
Week 15	5	5	79,350	-	10,000	60,350	70,350	9,000	63,300	-	(36,700)

8.1.2 Profit and Loss Statement

A pro forma profit and loss statement is shown in Table 23 for the first five years of operation; it is based on a depreciation and interest schedule as outlined in Tables 24 and 25. The statement reflects certain assumptions including:

* The selling price of the unit remains constant although the margin is reduced the second and third year in order to gain greater market penetration. The margin is kept high in the first year to ensure survival, but can be reduced when management has a year of experience.

* Plant overhead and office salaries continue to rise up to Year-3 then remain constant in Year-4 and Year-5 to reflect constant sales volume.

* Taxes are assumed at 50%.

* A significant portion of the profit is allocated to reducing debt and increasing working capital. In reality, more money would be spent on plant and equipment to upgrade the product and increase efficiency. Presumably the $450,000 long term debt would carry a specific 10 to 20 year repayment schedule and the funds generated by profits would go to:

  - working capital (cash and inventory);
  - capital equipment;
  - product improvement;
  - dividends.

* The debt charges are based on the high working capital requirements. Any other arrangements (e.g. prepayment of work by the Applicant, purchase of units by the Governments at the time of completion, lower interest rates, etc.) will have a favourable effect on profits.

The exact course to be followed in the second and third year is extremely dependent on the management, although the above list provides a good starting point in order of priority in a situation where the debt payback is fixed.

From Table 23 it can be seen that the proposed modular housing plant in Hay River would be profitable from the first year of operation. The forecasted profit levels

Table 23

PRO FORMA PROFIT AND LOSS STATEMENTS
($'000)

	Year 1	Year 2	Year 3	Year 4	Year 5
Houses Sold (Units)	150	200	225	225	225
Sales (@ $16,000/unit)	$2,400	$3,200	$3,600	$3,600	$3,600
Costs of Goods Sold	1,810	2,600	2,800	2,800	2,800
Gross Margin	$ 590	$ 600	$ 800	$ 800	$ 800
Plant Overhead	$ 150	$ 200	$ 250	$ 250	$ 250
Admin. Salaries	150	175	200	200	200
Depreciation	38	35	32	30	28
Interest	70	72	73	69	64
	$ 408	$ 482	$ 555	$ 549	$ 542
Profit Before Taxes	$ 182	$ 118	$ 245	$ 251	$ 258
Taxes @ 50%	91	59	122	125	129
Net Profit	$ 91	$ 59	$ 123	$ 126	$ 129
Plus Depreciation	$ 38	$ 35	$ 32	$ 30	$ 28
Total Cash Flow	$ 129	$ 94	$ 155	$ 156	$ 157

Table 24

DEPRECIATION SCHEDULE

	Year 1	Year 2	Year 3	Year 4	Year 5
Plant					
Opening	$450,000	$422,500	$401,375	$381,306	$362,241
Depreciation @ 5%	22,500	21,125	20,069	19,065	18,112
Closing	$422,500	$401,375	$381,306	$362,241	$344,129
Equipment					
Opening	$150,000	$135,000	$121,500	$109,350	$ 98,415
Depreciation @ 10%	15,000	13,500	12,150	10,935	9,841
Closing	$135,000	$121,500	$109,350	$ 98,415	$ 88,574
Plant	$ 22,500	$ 21,125	$ 20,069	$ 19,065	$ 18,112
Equipment	15,000	13,500	12,150	10,935	9,841
Total Depreciation	$ 37,500	$ 34,625	$ 32,219	$ 30,000	$ 27,953

Table 25

INTEREST SCHEDULE
(assuming High Cash Flow Profile)

Capital Required		Sources	
Plant	$450,000	Equity	$150,000
Equipment	$150,000	Debt (I.E.D.F. @ 9%)	$450,000
W. Capital (avg. for the year)	$250,000	W. Capital (Bank @ 12%)	$250,000
	$850,000		$850,000

	Year 1	Year 2	Year 3	Year 4	Year 5
Debts - Start of Year	$ -	$700,000	$700,000	$700,000	$650,000
Repayment (Borrowing) Gov.	(450,000)	50,000	50,000	50,000	50,000
Bank	(250,000)	(50,000)	(50,000)	-	-
Debt - End of Year	$700,000	$700,000	$700,000	$650,000	$600,000
Interest Gov. @ 9%	$ 40,500	$ 36,000	$ 31,500	$ 27,000	$ 22,500
Outstanding Debt	(450,000)	(400,000)	(350,000)	(300,000)	(250,000)
Interest Bank @ 12%	$ 30,000	$ 36,000	$ 42,000	$ 42,000	$ 42,000
Outstanding Working Capital	(250,000)	(300,000)	(350,000)	(350,000)	(350,000)
Total Interest Charges	$ 70,500	$ 72,000	$ 73,500	$ 69,000	$ 64,500

are felt to be sufficiently high to attract a most competent Investor/Manager for the proposed plant.

8.2 Sources of Funds

It is suggested that the capital cost of the plant and equipment and working capital requirements be financed in the following manner.

* Investor/Manager	$ 75,000
* Hay River Band	75,000
* Loan	450,000
CAPITAL COST	$600,000
WORKING CAPITAL (maximum line of credit)	$900,000

8.2.1 Investor/Manager ($75,000 for the purchase of 49% of the Company)

RMC Resources Management Consultants Ltd. have located an Investor who has both the financial and technical capability to undertake the project on a turn-key basis and assume the ten year management contract.

8.2.2 Hay River Band ($75,000 for the purchase of 51% of the Company)

A grant of $75,000 from the Indian Economic Development Fund.

8.2.3 Loan ($450,000)

A loan from the Indian Economic Development Fund at 6¼% on the first $25,000 and 8¼% on the balance.

8.2.4 Working Capital (maximum $900,000)

A line of credit at the bank supported by a joint guarantee by the Government and the Investor/Manager. A line of credit at the bank would also be enhanced by virtue of Canadian Arctic Gas Pipeline Ltd. (Applicant) intentions of placing an order for an 800 man camp with the proposed plant and willingness of the Applicant to prepay part of the order. Any further orders from the Applicant would

only reinforce the position vis-a-vis line of credit at the bank.

9. BLUEPRINT FOR ACTION

As it is the intention of the Applicant to proceed with the initial phases of the construction of the gas pipeline the winter of 1976-1977, the proposed plant would have to be in operation, at the latest, autumn 1975 in order to both complete the order for an 800-man camp for the Applicant as well as build a number of housing units to prove to such agencies as the N.W.T. Housing Corporation its ability to offer quality housing at competitive prices. Every effort should be made, needless to say with the full support of the Applicant, to complete in whole or at least in part, the shelter needs of the *second* 800-man camp.

As such, time is of the essence both from a planning and implementation point of view. It is imperative that the following items of business be completed as quickly as possible and no later than October 1974.

(a) Approval of the feasibility study by the Territorial and Federal Governments and commitment as to its support.

(b) Discussions and, in turn, acceptance of the proposal by the Hay River Band; otherwise, seek alternate ownership and financial arrangement.

(c) Financial commitment of the Indian and Eskimo Affairs Branch with respect to the Indian Economic Development Fund support.

(d) Selection of the Investor/Manager and the drafting of the management contract.

(e) Incorporation of the "Territorial Modular Homes Ltd.", appointment to the Board, opening up an office in Hay River and the deposit of the $150,000 to the account of the Company.

Between November 1974 and March 1975 the following phases of work would need to be completed:

(a) Selection and lease/purchase of the plant site; also provisions for municipal services.

(b) Complete design of the building and place orders for April 1975 delivery.

(c) Design and, in turn, selection of all items of machinery, equipment, furniture, supplies, etc. needed to operate the plant, for June delivery.

(d) Interviews and selection of individuals for all key positions in the plant, effective July 1975.

(e) Selection of suppliers and preliminary indication of type and size of orders to be placed, prices for materials, delivery dates, etc.

Between April and August 1975 the following remaining major items of work would have to be completed.

(a) A loan of $450,000 from the Indian Economic Development Fund.

(b) Preparation of the site and erection of the building.

(c) Installation of all machinery, equipment, furniture and supplies.

(d) Finalizing of the order for the 800-man camp and other housing needs (e.g. Northwest Territories Housing Corporation).

(e) Material explosion and placement of specific orders for materials and supplies.

(f) Arrival of individuals for all key positions.

(g) Hiring of clerical and semi-skilled and unskilled labour.

Official opening of the plant and commencement of production, October 1, 1975.

RMC Resources Management Consultants Ltd., in addition to lining up the Investor/Manager, would also be prepared to assume the full responsibility, i.e. on a turn-key basis, for the implementation of the above outlined work program including the design and preparation of:

(a) organization plan;

(b) marketing, operations and financial plan;

(c) management information and accounting system;

(d) organizational manual including position descriptions of all key positions;

(e) procurement, production planning, scheduling and inventory control systems;

(f) labour standards;

(g) all other aspects of management.

APPENDIX I

HOUSING STOCK BY OWNERSHIP

APPENDIX I

HOUSING STOCK BY OWNERSHIP

	Northern and Territorial Rental Program	Public, Senior Citizen and Singles Housing	Municipality, NWT, & Federal Govt. Staff Housing	Company Housing	Rented from Private Owner	Owner Occupied	Total
Fort Smith Region	632	112	838	588	350	1,044	3,564
Inuvik Region	371	122	597	314	74	320	1,798
SUB TOTAL	1,003 18.7%	234 4.4%	1,435 26.8%	902 16.8%	424 7.9%	1,364 25.4%	5,362 100%
Baffin Region	845	20	459	136	25	19	1,504
Keewatin Region	400	-	76	22	1	11	510
TOTAL NWT	2,248 (30.5%)	254 (3.4%)	1,970 (26.7%)	1,060 (14.4%)	450 (6.1%)	1,394 (18.9%)	7,376 (100%)

SOURCE: NWT Housing Corp. Unpublished Survey, 1974.

HOUSING STOCK BY OWNERSHIP cont......#2

	Northern & Territorial Rental Program	Public, Senior Citizen & Singles Housing	Municipality, N. W. T., Staff Housing	Federal Govt., Staff Housing	Rented From Private Owner	Company Housing	Owner Occupied	Total
Bathurst Inlet	-	-	-	-	-	-	4	4
Cambridge Bay	9	-	5	5	-	2	-	111
Coppermine	101	-	-	-	-	-	-	101
Ft. Liard	-	-	3	4	-	3	48	58
Ft. Providence	39	-	4	3	2	5	32	85
Ft. Simpson	33	8	26	30	8	6	71	182
Wrigley	-	-	2	1	1	1	18	23
Ft. Smith	12	12	72	26	36	13	132	303
Gjoa Haven	48	-	2	1	-	2	5	58
Hay River	22	51	39	42	53	63	259	529
Holman	41	-	-	-	-	-	-	41
Kakisa Lake	-	-	-	-	-	-	9	9
Jean Marie R.	-	-	1	-	-	-	9	10
Lac La Martre	-	-	2	-	-	-	20	22
Pelly Bay	35	-	-	-	-	-	-	35
Nahanni Butte	-	-	1	-	-	-	14	15
Rae/Edzo	128	-	9	2	2	5	48	194
Snowdrift	-	-	-	-	-	-	-	-
Spence Bay	66	-	9	1	-	1	-	77
Trout Lake	-	-	-	-	1	-	10	11
Yellowknife	8	41	308	240	247	487	365	1,696
Echo Bay	-	-	-	-	-	-	-	-
Tungsten	-	-	-	-	-	-	-	-
Enterprise	-	-	-	-	-	-	-	-
Pine Point	-	-	-	-	-	-	-	-

continued.......#3

HOUSING STOCK BY OWNERSHIP cont......#3

	Northern & Territorial Rental Program	Public Senior Citizen & Singles Housing	Municipality, N. W. T., Staff Housing	Federal Govt. Staff Housing	Rented From Private Owner	Company Housing	Owner Occupied	Total
Detah	-	-	-	-	-	-	-	-
Ft. Resolution	-	-	-	-	-	-	-	-
Rae Lakes	-	-	-	-	-	-	-	-
FORT SMITH REGION	632	112	483	355	350	588	1,044	3,564
Aklavik	87	10	18	4	4	4	30	157
Arctic Red River	16	-	1	-	-	2	11	30
Colville Lake	-	-	-	-	-	1	14	15
Ft. Franklin	31	-	10	-	-	2	26	69
Ft. Good Hope	16	14	6	5	2	6	41	90
Ft. McPherson	54	4	16	10	5	4	67	160
Ft. Norman	29	-	5	3	-	2	16	55
Inuvik	36	94	96	376	62	238	78	980
Norman Wells	5	-	4	23	-	51	11	94
Paulatuk	13	-	-	-	-	1	-	14
Sachs Harbour	11	-	3	3	-	1	12	30
Tuktoyaktuk	73	-	11	3	1	2	14	104
INUVIK REGION	371	122	170	427	74	314	320	1,798
TOTAL FORT SMITH AND INUVIK REGION	1,003	234	653	782	424	902	1,364	5,362

APPENDIX II

IMMEDIATE HOUSING NEED

APPENDIX II

IMMEDIATE HOUSING NEED

	1 Room/1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms	5 Bedrooms	6 Bedrooms	Total	C.A.B. Estimate at Required Density of 4.0
Fort Smith Region	1	-	159	232	103	63	558	
Inuvik Region	20	8	66	92	72	27	285	
	21	8	225	324	175	90	843	
Bathurst Inlet	1	-	-	-	-	-	1	-
Cambridge Bay	-	-	-	72	7	3	32	-
Coppermine	-	-	-	20	4	2	26	-
Ft. Liard	-	-	8	10	4	-	22	26
Ft. Providence	-	-	6	8	7	4	25	75
Ft. Simpson	-	-	-	8	9	5	22	132
Wrigley	-	-	-	4	1	5	10	19
Ft. Smith	-	-	13	16	8	5	42	-
Gjoa Haven	-	-	12	13	2	1	28	-
Hay River	-	-	43	27	8	4	82	160
Holman	-	-	-	7	7	-	14	-
Kakisa Lake	-	-	2	2	1	-	5	-
Jean Marie R.	-	-	3	-	-	1	4	2
Lac La Martre	-	-	-	3	3	4	10	-
Pelly Bay	-	-	-	10	-	-	10	-
Nahanni Bute	-	-	4	2	-	1	7	3
Rae/Edzo	-	-	-	24	21	17	62	-
Snowdrift	-	-	-	8	4	2	14	-
Spence Bay	-	-	13	13	4	-	30	-
Trout Lake	-	-	3	4	1	-	8	-
Yellowknife	-	-	52	31	12	9	104	-
Echo Bay	-	-	-	-	-	-	-	-
Tungsten	-	-	-	-	-	-	-	-

continued.......#2

IMMEDIATE HOUSING NEED cont.... #2

	1Room/1 Bedroom	2 Bedrooms	3 Bedrooms	4 Bedrooms	5 Bedrooms	6 Bedrooms	Total	C.A.B. Estimate at Required Density of 4.0
Enterprise	-	-	-	-	-	-	-	1
Pine Point	-	-	-	-	-	-	-	-
Detah	-	-	-	-	-	-	-	-
Ft. Resolution	-	-	-	-	-	-	-	-
Rae Lakes	-	-	-	-	-	-	-	-
FORT SMITH REGION	1	-	159	232	103	63	558	
Aklavik	-	-	-	13	9	11	33	34
Arctic Red River	-	-	-	2	2	-	4	-
Colville Lake	-	-	2	1	1	-	4	-
Ft. Franklin	-	-	-	11	9	4	24	12
Ft. Good Hope	-	-	24	6	5	2	37	-
Ft. McPherson	-	-	3	18	11	5	37	48
Ft. Norman	-	-	-	10	2	2	14	1
Inuvik	20	6	10	10	18	-	64	101
Norman Wells	-	2	4	2	-	-	8	-
Paulatuk	-	-	6	2	2	1	11	-
Sachs Harbour	-	-	-	2	7	-	9	-
Tuktoyaktuk	-	-	17	15	6	2	40	46
INUVIK REGION	20	8	66	92	72	27	285	-
TOTAL FORT SMITH AND INUVIK REGIONS	21	8	225	324	175	90	843	

Source: Housing Corp. Unpublished Survey, 1974.

APPENDIX III

HOUSING STOCK LIFE EXPECTANCY

APPENDIX III

HOUSING STOCK LIFE EXPECTANCY (not incl. Staff Housing)

	0-5 Years	5-10 Years	10-20 Years	20+ Years	Total
Fort Smith Region	322	131	735	972	2,161
Inuvik Region	92	72	417	295	876
	414	203	1,152	1,267	3,037
	13.6%	6.7%	38.0%	41.7%	100%

	0-5 Years	5-10 Years	10-15 Years	15-20 Years	20-25 Years	25+ Years	Total	1975 Population Projected (NWT)
Bathurst Inlet	-	-	-	-	4	-	4	50
Cambridge Bay	36	7	32	9	15	-	99	831
Coppermine	19	1	14	49	17	-	100	813
Ft. Liard	32	10	2	4	-	-	48	305
Ft. Providence	12	12	2	22	19	-	67	681
Ft. Simpson	8	11	24	20	44	3	115	1,470
Wrigley	4	12	3	-	-	-	19	176
Ft. Smith	34	6	41	24	58	48	211	2,364
Gjoa Haven	19	-	-	13	21	-	53	352
Hay River	37	4	24	32	204	85	386	3,734
Holman	10	2	7	17	5	-	41	308
Kakisa Lake	-	9	-	-	-	-	9	49
Jean Marie R.	-	-	1	8	-	-	9	51
Lac La Martre	3	10	2	5	-	-	20	187
Pelly Bay	3	-	29	2	1	-	35	274
Nahanni Butte	2	5	7	-	-	-	14	77
Rae/Edzo	30	18	47	-	68	-	163	1,254
Snowdrift	8	-	15	5	4	-	32	256
Spence Bay	16	2	30	7	11	-	66	267
Trout Lake	3	-	6	-	2	-	11	56
Yellowknife	46	22	136	97	305	53	659	7,836
Echo Bay	-	-	-	-	-	-	-	99
Tungsten	-	-	-	-	-	-	-	130

continued......#2

HOUSING STOCK LIFE EXPECTANCY (not incl. Staff Housing)...... cont....#2

	0-5 Years	5-10 Years	10-15 Years	15-20 Years	20-25 Years	25+ Years	Total	1975 Population Projected (NWT)
Enterprise	-	-	-	-	-	-	-	65
Pine Point	-	-	-	-	-	-	-	1,556
Detah	-	-	-	-	-	-	-	197
Ft. Resolution	-	-	-	-	-	-	-	723
Rae Lakes	-	-	-	-	-	-	-	85
FORT SMITH REGION	322	131	422	314	778	194	2,161	24,246
Aklavik	13	13	41	12	32	10	121	785
Arctic Red River	2	-	11	9	3	-	25	134
Colville Lake	-	-	8	6	-	-	14	70
Ft. Franklin	2	8	13	34	-	-	57	393
Ft. Good Hope	12	-	45	8	10	8	84	379
Ft. McPherson	26	19	49	9	14	8	125	842
Ft. Norman	16	7	6	1	11	-	41	288
Inuvik	11	10	52	17	79	103	272	4,067
Norman Wells	-	4	5	7	-	-	16	416
Paulatuk	1	-	6	5	-	-	12	111
Sachs Harbour	-	7	-	10	4	-	21	166
Tuktoyaktuk	8	4	13	50	13	-	88	691
	91	72	249	168	166	129	876	8,342
TOTAL FORT SMITH AND INUVIK REGIONS	414	203	671	482	944	323	3,037	32,588

SOURCE: Housing Corp. Unpublished Survey, 1974.

STUDY 2

AN ENTREPRENEURIAL OPPORTUNITY STUDY
FOR CONCRETE PRODUCTS ALONG THE
MACKENZIE VALLEY PIPELINE
AND HIGHWAY CORRIDOR

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1. OBJECTIVES OF THE STUDY

The objective of the study is to assess the commercial and industrial opportunity that could result from the construction and operation of the Mackenzie Valley Pipeline and Highway in terms of the manufacture of concrete products.

The opportunity was initially identified as a result of the large implied demand for precast concrete river weights and saddle weights required for pipeline construction and the resulting probable development of a manufacturing infrastructure for precast concrete products along the Mackenzie Valley Corridor.

It is evident that the activity resulting from the pipeline construction is of a relatively short duration. The long term benefits of such activity, however, should result in the establishment of a larger, stable and more dynamic market for residential, commercial and industrial precast concrete products in the Northwest Territories.

This report therefore first assesses the immediate opportunity generated by the pipeline with respect to the concrete river weights requirements, and then assesses the longer term opportunity for general precast concrete products in terms of their feasibility from the marketing, operations, human resources and financial points of view.

Cognizance was made of the opportunities for local entrepreneurship and resident participation in these activities, particularly among the native population of the Mackenzie Valley Corridor.

Because of both the short term and long term approaches to the study, the report has been structured under the following market-oriented sections:

* Section 3 deals with the opportunity provided by the need for precast river weights for the pipeline construction.

* Section 4 is concerned with the long term opportunity for the manufacture of precast concrete products.

2. SUMMARY

2.1 Overview

The economic development of the Northwest Territories is made the more difficult because of:

* a large geographic region;
* high cost of transportation;
* wide dispersement of communities;
* relatively small concentrated market;
* shortage of skilled labour;
* high cost of labour;
* harsh climate; and
* high cost of imported goods.

Yet in spite of these drawbacks, substantial economic growth has taken place and is expected to continue at an accelerated pace due to the exploration for and discovery of vast quantities of oil and natural gas. The traditional activities of hunting, trapping and fishing are rapidly being diminished by the economic thrust of government presence, exploration, mining and forest related activities and, more recently, oil and gas.

With further economic activity generated by the construction of the Mackenzie Highway and the natural gas pipeline along the Mackenzie Valley Corridor, this study is directed to those opportunities that could capitalize and/or be reinforced by the two above-mentioned projects.

A preliminary analysis of the economic benefits of the Corridor activity has identified an opportunity for the establishment of a concrete products industry to service the needs of the N.W.T. The initial demand will be created by the requirements of the pipeline for precast concrete river weights. The feasibility of establishing a precast concrete products plant was, in turn, envisioned as a resulting industry.

Assessing the requirements of the pipeline, the demand for concrete products, the geographic area and other factors, it was established that the pipeline and the market needs for concrete products represented separate and distinct opportunities.

River weights production would serve a particular short term market with little or no probability of conversion to other precast products to serve the longer term potential of the market.

On the other hand, a preliminary assessment did indicate a distinct opportunity for a precast concrete products industry to service a separate market demand.

As a result, this feasibility study has been prepared in two sections:

* Section 3 The Entrepreneurial Opportunity for Precast Concrete River Weights for Pipeline Construction;

* Section 4 The Entrepreneurial Opportunity for the Manufacture of Precast Concrete Products.

2.2 The Entrepreneurial Opportunity for Precast Concrete River Weights for Pipeline Construction

2.2.1 River Weights Requirements

Section 3, on the basis of information supplied by the Applicant, discusses the requirements for river weights for pipeline construction. Within the boundaries of the Northwest Territories approximately 79,000 five-ton weights would be required. Using the assumption that the more difficult terrain will require the majority of weights and time to construct, an estimate was made of the probable weight requirements by construction spread and construction season as shown in Table 1.

2.2.2 Casting Plant Locations

The casting plants should be located as close to the final point of use as possible. These locations would be at borrow pits, stockpile sites, or other sites most convenient for construction of the pipeline and the related material transport logistics.

2.2.3 Casting Plant Facility

Section 3 outlines the type of plant facility that could be used. It was established that each of the plants would:

* have a capacity of 6,000 weights per season;
* require 100 days of summer construction;

* receive all raw materials on a voucher basis from the Applicant, otherwise have this function performed by the Holding Company;
* have 14 employees including a Plant Superintendent;
* be mobile but fixed for each casting season;
* sell its products FOB Plant to the Applicant; and
* have full capital write-off in two years.

Table 1

Pipeline Construction Period	Construction Spread	Weights Required	Weights Construction Period
Winter 1977-1978	A	5,590	Summer 1977
	B	5,590	Summer 1977
	C	3,978	Summer 1977
	D	5,252	Summer 1977
	E	5,590	Summer 1977
Winter 1978-1979	A	8,272	Summer 1978
	B	9,637	Summer 1978
	C	3,520	Summer 1978
	D	7,172	Summer 1978
	E	7,700	Summer 1978
	F	7,700	Summer 1978
Winter 1979-1980	F	1,377	Summer 1979
	G	3,897	Summer 1979
	H	3,726	Summer 1979
TOTAL WEIGHTS REQUIRED		79,000	

Converting these requirements into raw materials gave the following:

* Cement - 49,375 tons
* Sand - 140,620 cubic yards
* Aggregate + Reinforcing Steel - 85,320 cubic yards

Annual cost of operations at each of the plants were estimated at:

* Labour expense	$118,800
* Operating expense	80,000
* Administrative expense	40,000
* Depreciation and Repayment Allowance	266,000
TOTAL ANNUAL OPERATING EXPENSE	$504,800

As a per unit weight selling price of $100.00 (i.e. value added, and exclusive of raw materials), it was estimated that each of the plants would experience the following financial status:

* Gross Annual Revenue	$600,000
* Net Profit before Taxes	94,600
* Profit after Tax	47,300
* Capital Requirements	
- Building and Equipment	$380,000
- Working Capital	50,000
TOTAL	$430,000

2.2.4 Investment

The equipment investment for a single plant would be $380,000 which would earn an annual net profit of $47,300 (allowing for full depreciation over the two year period). It is suggested that funds be made available by the Department of Indian and Northern Affairs, via the Indian Economic Development Fund, to the full extent of the cost of each of the plants. A total of five plants is suggested for a total capital cost of $1,900,000. Although a 12% interest rate was used in the calculation, it would be more likely that a 9% rate of interest would prevail. The Applicant has also shown a considerable amount of interest in the project and may be interested in participating jointly with the Government in financing the venture.

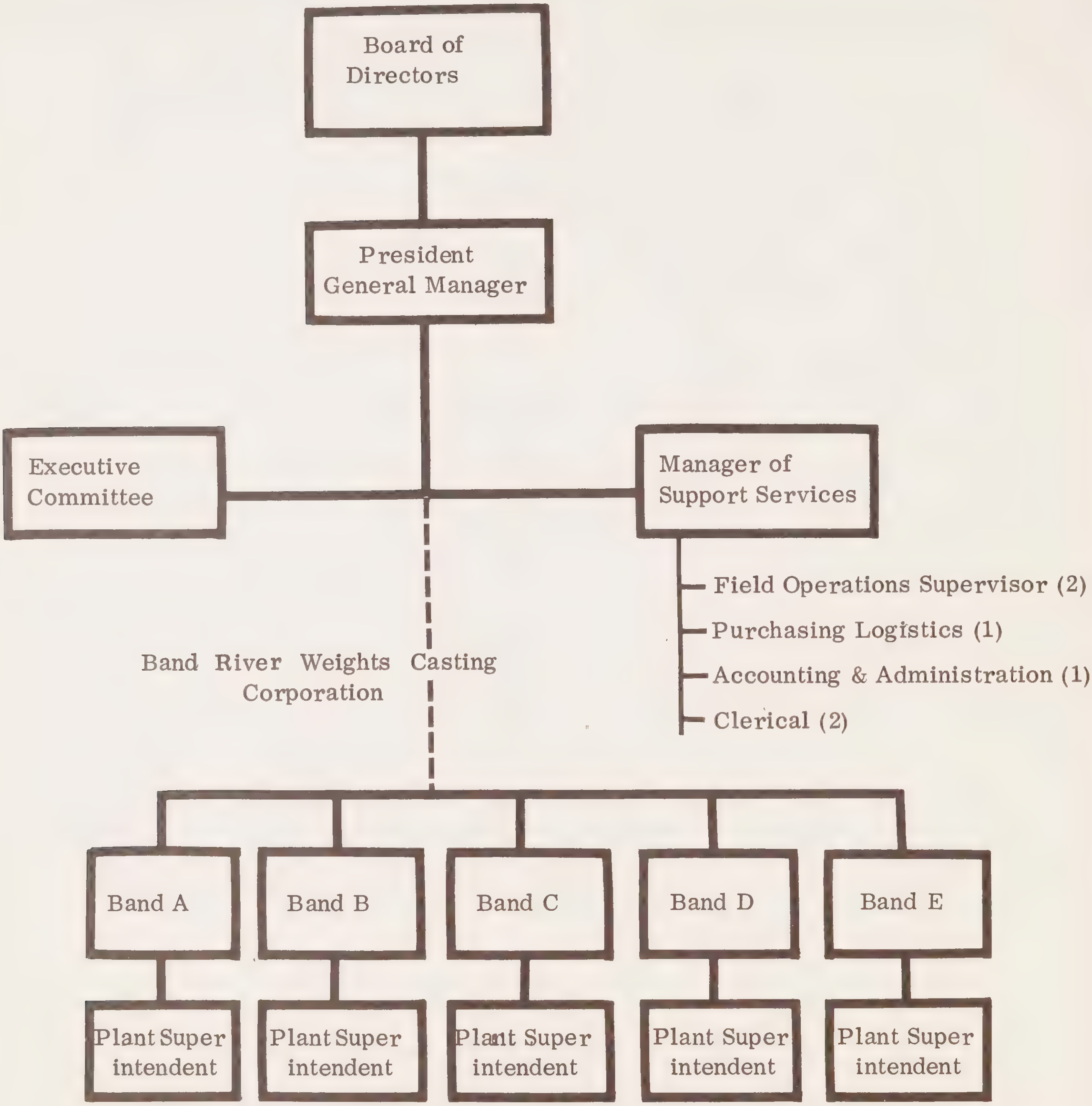
No direct investment would be expected from those taking part as it is recommended that the various Indian Bands be selected as plant operators. All funds generated as profits would then be used by each of the bands as investment capital to develop local enterprise once the pipeline construction ceases.

2.2.5 Ownership

A corporate structure based on a Holding Company principle is suggested. The Holding Company would provide financial and technical and administrative support to each of the Band plant operations. A nominal administrative fee of $40,000 per year per plant was used in the cost calculations to reflect the cost of this expense. Each Band would own its own plant under the terms of the loan agreement. The Corporate organization chart is shown in Exhibit I.

EXHIBIT 1

NWT CASTING CORPORATION (PROPOSED CORPORATE STRUCTURE FOR THE HOLDING COMPANY)



* Each Band would register their Corporations under their respective corporate ownerships.

Much of the success of the project would rest with the quality of the officers of the Holding Company. It is anticipated that qualified people would either be seconded from the Federal and Territorial Governments, or hired under contract by the Government from industry.

The basic advantages are:

* earned capital stays in the Territories to finance local enterprises once the construction ceases;
* provides additional job training opportunity to native people under a "Hire North" type of concept;
* exposes the native people to entrepreneurship and management.

It is expected that both the Department of Indian and Northern Affairs and the Territorial Government would have a significant input in the project. As soon as there is some indication of the Government's approval of the Applicant's request to build the pipeline (and its timing), a concerted effort should be made to attract as many of the Indian people as the projected labour requirements warrant for an on-the-job training program in the concrete products industry. This course of action is critical to the success of the proposed venture (especially in the trades and supervisory positions) if we are to avoid or, at least, minimize hiring non-Indian personnel. From the ranks of the river weight casting operations would then come the required skills to operate the proposed precast concrete products plant(s).

2.2.6 Implementation

The implementation program outlined in Section 3.7 is divided into two major divisions. The first being the detailed analysis and planning required prior to the Applicant's receiving approval for pipeline construction. The second phase includes those general activities that would be required once construction permits are issued.

RMC Resources Management Consultants Ltd. would be prepared to work with the Governments and the native people in the implementation of the program. The intensive planning and detailed analysis needed, and the concentrated operations management requirements during the operating phase demand the application of skills and

a depth of related project management experience available to RMC.

2.3 The Entrepreneurial Opportunity for the Manufacture of Precast Concrete Products

2.3.1 Market Area

A manufacturing undertaking requires both a population concentration and a continuing economic activity for viable support. The only area that provides this support is the Great Slave Lake area from Fort Simpson to Yellowknife and south. This geographic area presently supports a population of approximately 19,000 (1974) with a probable increase to 25,000 by 1980.

2.3.2 Market Projection

Four classes of products were originally selected for consideration, namely:

* concrete block;
* concrete brick;
* other precast products;
* concrete sewer and water pipe.

Due to construction problems caused by permafrost and the size of the market, concrete sewer and water pipe were deleted from further consideration. The projected market volume for each of the three remaining products are:

	1974	1975	1981 (with pipeline)
Concrete Block (8" equivalent)	70,000	100,500	255,000 units
Concrete Brick (standard brick)	66,000	70,400	141,000 units
Other Products	-	-	$60,000

2.3.3 Nature of Competition

The majority of concrete block shipped to the Northwest Territories originates in either Grant Prairie or Edmonton, Alberta. The block is a light weight aggregate block which, weighing less than the stone aggregate

block (28 lbs. vs. 40 lbs.), has a lower associated transportation cost. A similar situation exists for brick. The quantity of block shipped to the Territories is small in relation to the quantities manufactured for the Alberta market. A conservative estimate of the size of the market in Alberta is approximately 16,000,000 concrete blocks per year, compared to the estimated 1974 volume of 70,000 blocks in the Territories.

A competitive price advantage on the part of the N.W.T. manufacturer would in all probability enable a local manufacturer to take care of the total market. The loss of the market would be of little concern to the Alberta producers.

2.3.4 Manufacturing Facility

The main plant area would be approximately 60 feet by 60 feet (3,600 square feet) and would provide sufficient space for block and brick molding as well as precast molding of other products. Four steam kilns in an area of 2,400 square feet would be sufficient for production requirements for the immediate future.

Approximately 120,000 square feet of land would be required for plant, raw material storage and outside finished product storage.

Used equipment for the most part is recommended. New machinery with its high costs would be beyond the economic feasibility of the project.

Significant investment would be required for molds (forms) for both the block and brick operation. A minor investment would be required for the "other products" category.

Table 2

Summary of Facility Capital Cost

Land (fully serviced)	$ 25,000
Building	74,000
Equipment - Block and Brick	49,000
- Other Products	2,000
Molds - Block and Brick	25,000
- Other Products	4,000
Total Capital Equipment	$180,000

2.3.5 Operating Characteristics

The plant would operate only during the five summer months, which is more than adequate for market volumes for the immediate future. Winter production would be limited to precasting the other products. There should be little demand for output during the winter due to winter construction costs in the building industry; what demand there is would be serviced from inventory.

At a 1980 demand level of 250,000 blocks and 140,000 bricks the plant could produce sufficient volume in the five summer months.

It is estimated that the plant at this volume, plus "other products" volume, would require 614 tons of cement, 4,920 cubic yards of ½ inch stone aggregate and 9,670 cubic yards of sand.

At this volume a total of five people would be required, one of whom would be part-time.

* One Manager
* One Molder
* One Mixer
* One Kiln Man
* One Bookkeeper (Clerk/Typist part-time)

The estimated annual cost of staff is $51,340.00. At an operating level of:

* 250,000 blocks
* 140,000 bricks
* 3,995 tons of other precast products

...the annual costs of operation are:

* Raw Material	$106,850
* Operations - Overhead	19,300
- Salaries and Wages	51,340
* Depreciation	17,390
* Interest Charges	18,000
Total Operating Costs	$212,880

2.3.6 Plant Location

Because of high transportation costs and the high cost of cement (approximately 44% of total operating

costs) location of the proposed plant becomes critical. A comparison between the laid down price of concrete block from the proposed Hay River plant with the competitive lightweight block from Grand Prairie indicates the preferred location for the plant to be Hay River.

Table 3

Laid Down Price of Block

Destination	Ex Grand Prairie (Light Weight)	Ex Hay River (Heavy Weight)
	(¢/Block)	(¢/Block)
Hay River	93.80	65.00
Yellowknife	119.56	111.40
Rae/Edzo	119.56	104.60
Fort Providence	99.68	95.40
Fort Simpson	119.56	107.40
Enterprise	93.80	70.00
Pine Point	99.68	88.20
Fort Resolution	108.08	101.40
Fort Smith	108.08	99.00
FOB Price	42¢	65¢

Should the plant be located in Yellowknife or Fort Simpson, the 65¢ per block price would have to be significantly increased to reflect an estimated 22¢ per block backhaul cost to other markets plus a $15.00 per ton increase in cement landed in these two locations. However, it should be pointed out that the cost disadvantages associated with a Yellowknife or Fort Simpson location (or for that matter places like Rae/Edzo) could be equalized by such government initiative as financing the whole project via a grant as opposed to a combination of a grant/soft loan or to see it stand on its own feet supported by funds at competitive rates.

2.3.7 Investment Participation and Ownership

The direct participation by an Owner/Manager appears to be the best route to follow in seeking local participation. There are in Hay River several sand and gravel operations (source of raw material) and a Redi-Mix Concrete plant (source of expertise). Failing to arouse the necessary interest with existing entrepreneurs to

undertake the project entirely on their own (to a great extent the result of a very modest return on equity), a joint venture arrangement should be pursued with a partner with access to low cost venture capital.

If the latter route is taken an Investor/Manager would have to be attracted to provide the entrepreneurial and management skills. If the Investor/Manager approach is taken then we would recommend that he should be required or facilitated to invest $30,000 for 49% ownership of the enterprise.

The Department of Indian and Northern Affairs, on behalf of the Hay River or any other Band, would contribute the balance via the Indian Economic Development Fund. At the end of a suitable length of time, say ten years, the Investor/Manager could be bought out as per some agreed upon formula with the Band receiving full control and ownership of the operations. The financing could come via the following formula:

* Investor/Manager (49%)	$ 30,000
* Band Ownership (51% via grant from IEDF)	30,000
* Loan from IEDF @ 9% over 10 years	136,000
* Working Capital (line of credit at the bank jointly guaranteed by Investor and Government)	50,000

This would provide $180,000 to cover capital expenditures, $16,000 for start-up costs and $50,000 working capital. The organization structure is simple. The Investor/Manager would be deeply involved not only in sales and in the actual physical operation of the plant but also in overall direction and control.

2.3.8 Financial Feasibility

The financial viability of the plant is best illustrated by the pro forma profit and loss statement as shown in Table 4. As shown in Table 4, the concrete products plant swings from a loss to a modest profit level in the third year (1978) of operation and improves its financial performance in each of the subsequent years. The profitability of the venture is sufficient not only to repay the Indian Economic Development Fund loan of $136,000 over a ten year period but also, after 1980, to provide an attractive level of dividends to both the

Table 4

PRO FORMA PROFIT AND LOSS FIVE YEAR ESTIMATE
(CONSTANT 1974 DOLLARS)

Based on Unit Selling Prices of: Block 65¢
Brick 5¢
Other $15.00 per ton

	1976	1977	1978	1979	1980
Sales Units					
Block Units	129,000	171,000	217,000	229,500	245,000
Brick Units	75,000	102,600	121,000	127,500	135,000
Other Prod. (tons)	500	1,500	3,000	3,500	4,000
Revenue	$ 95,100	$138,780	$192,620	$208,050	$226,000
Operating Costs					
Materials	$ 44,290	$ 64,634	$ 89,709	$ 96,895	$105,255
Salaries & Wages	34,000	35,000	47,200	50,804	51,340
Overhead (operating)	7,051	8,936	12,122	13,150	13,811
Sales & Admin.	4,200	4,100	4,900	5,100	5,700
Depreciation	17,390	15,548	13,987	12,659	11,524
Interest	18,240	17,016	15,792	14,568	13,344
Start-up Costs	16,000	-	-	-	-
Total	$141,171	$145,234	$183,710	$193,176	$200,974
Net Profit (loss) before Taxes	$(46,071)	$ (6,454)	$ 8,910	$ 14,747	$ 24,946
Taxes	-	-	-[1]	-[1]	-[1]
Net Profit (loss)	$(46,071)	$ (6,454)	$ 8,910	$ 14,747	$ 24,946
Plus Depreciation	$ 17,390	$ 15,548	$ 13,987	$ 12,659	$ 11,524
Cash Flow	$(26,681)	$ 9,094	$ 22,897	$ 27,406	$ 36,470

[1]Assume no tax liability due to previous losses

Investor/Manager as well as the Band.

2.3.9 Implementation

Section 4.10 of the report outlines an action-oriented program for the implementation of the concrete products project. The suggested program for implementation is structured to provide an operating facility by the summer of 1976.

3. THE ENTREPRENEURIAL OPPORTUNITY FOR PRECAST CONCRETE RIVER WEIGHTS FOR PIPELINE CONSTRUCTION

3.1 Introduction

The construction of a pipeline along the Mackenzie Corridor will require large numbers of men and vast amounts of supplies. Included in these figures are the men and materials required for the casting of concrete river weights to be used during construction. As of the time of writing, the Applicant is unable to give any firm data as to the real number of weights required, the design criteria of the weights, or the locations at which these weights are to be used.

In spite of the lack of firm data, it would seem reasonable that opportunities should be available for local entrepreneurs and/or the native people to participate in those areas where specific needs could develop.

There are many considerations that make the short term activities associated with the project most difficult in terms of entrepreneurial participation.

* The project is of short duration, i.e. three to four years.
* The scale of activity will demand a very high financial investment which must be recouped within the time span of construction activity.
* The demands for specific skills which are not normally found in quantity in the north create additional constraints to participation.
* The logistics support systems demand a highly developed organization and management expertise.

There are, however, certain characteristics of the pipeline construction program that do weigh on the positive side as far as concrete weight manufacturing is concerned, namely:

* The direct construction period of the pipeline is limited to the winter months as far as pipe laying acitivites are concerned. This would mean that certain trades and skills trained by the Applicant in the North, e.g. heavy equipment operators and mechanics would or could be available during the four to five summer months.

* The concrete river weights will, to a great extent, be manufactured in the summer to meet winter construction demands. Summertime concrete construction is preferred because of the difficulties encountered in winter pouring of concrete. The heating of fluid concrete is necessary in order to preserve the setting qualities of the material. Concrete poured in winter also requires a heated area, which in the climate of the Territories would add excessive cost to construction.

* The Applicant, due to his probable in-depth expertise in construction management, would have the logistics skills to supply the plant sites with all imported materials for manufacturing the weights. It is doubtful that local entrepreneurs would have the size and depth of organization to effectively take advantage of logistics saving in this area.

The Applicant in his submission, describes briefly the probable general procedure for casting the river weights.

> The weight casting operation will be conducted at field sites located at stockpile sites, compressor station sites, or where practical, at borrow pit locations. The sites will be situated as close as possible to the point of usage on the pipeline in order to minimize hauling requirements.
>
> These borrow sources which can provide granular material of concrete aggregate quality will be determined after field test information is available. Given this information, sufficient weight casting crews will be set

up to provide each contractor with the required weights prior to each working season. Where access to borrow is by snow or winter road, the required granular material may be stockpiled in the winter prior to pipeline construction.

The consideration here, is the opportunity afforded to residents of the north in taking some part in this summer production of river weights.

3.2 Material Requirements and Logistics

As previously mentioned, it would be advisable to permit the Applicant to purchase and stockpile all materials at the storage sites which he feels would be advantageous to him. The materials to be stockpiled would be:

* Cement
* Reinforcing Bar (rebar)

...which are the basic imported requirements. Sand and aggregate would be obtained from borrow pits.

Other material would be stockpiled as well which, if arrangements were made, could be made available to the weight casting crews. These include:

* Fuel
* Steel for Forms
* Lubricants
* General Maintenance Supplies

NOTE: Steel forms would probably be used due to the need for repetitive usage of the forms and the need for dimensional accuracy in placing bolt holes, bolt rings and rebar. The fabrication of these forms may well be an additional opportunity for northern participation. This is discussed in a subsequent section of this report.

Access to these imported materials, on a sub-contract basis, could be on a voucher purchase basis which would be deducted from the sale price of the weights.

EXHIBIT 2

PROPOSED ROUTE OF MACKENZIE VALLEY PIPELINE

Therefore, the local entrepreneur would be required to supply men and equipment as well as his own living support systems while actual raw materials and general supplies could be supplied from the stock piles of the Applicant. If this arrangement were not acceptable to the Applicant then the proposed Holding Company (subsection 3.6.2) would need to perform this function.

3.2.1 River Weight Requirements and Location

The latest data from the Applicant indicate that a total of approximately 79,000 five-ton river weights would be needed. Of this total 26,000 would be required for winter 1977-1978 construction, 44,000 for winter 1978-1979 construction and 9,000 for winter 1979-1980 construction.

A total of 70,000 weights would be required for the direct section from Richards Island, along the Mackenzie Corridor to the 60th parallel. The balance of 9,000 would be required for the section from the Yukon/N.W.T. border to the Mackenzie Corridor junction. A map of this route is shown in Exhibit II.

Pipeline construction activity according to the Applicant would take the form shown in Table 5 for three winter seasons of construction.

It can be assumed, and this is only an assumption, that the more difficult terrain would include a high requirement for river weights because of the number of river crossings. The construction spread use of weights could be as outlined in Table 6. (The period for weight manufacture is also shown.)

From Table 6 it can be seen that the weight requirement for a construction spread in 1977-1978 is approximately 5,600; for 1978/1979, 7,700 weights; and for 1979-1980, 3,800 weights.

3.3 <u>Casting Plant Locations</u>

In order to minimize the moving of casting operations during the short four-month summer period, it is suggested that one casting operation be established for each construction spread at a location chosen by the

Table 5.

Pipeline Construction Activity

	Construction Spread	From Mile Post	To Mile Post	Total Miles Construction	
Winter 1977-1978	A	0	60	60	Richards Island
				15	Parsons Lake Section
				75	
	B	190	265	75	
	C	265	350	95	
	D	510	590	80	
	E	590	665	75	
	TOTAL			410	
Winter 1978-1979	A	60	130	70	
	B	130	190	60	
	C	265	430	165	
	D	430	510	80	
	E	665	740	75	
	F	740	815	75	60th Parallel
	TOTAL			525	
Winter 1979-1980			(Prudhoe Bay Section)		
	F	350	370	20*	Yukon Border
	G	370	430	60	
	H	430	492	62	Main Line Junction
	TOTAL			142	

* "F" spread continues into Yukon.

Table 6.

Construction Spread Use of Concrete Weights

Pipeline Construction Period	Construction Spread	Weights Required	Weight Construction Period
Winter 1977-1978	A	5,590	Summer 1977
	B	5,590	"
	C	3,978	"
	D	5,252	"
	E	5,590	"
		26,000	
Winter 1978-1979	A	8,272	Summer 1978
	B	9,636	"
	C	3,520	"
	D	7,172	"
	E	7,700	"
	F	7,700	"
		44,000	
Winter 1979-1980	F	1,377	Summer 1979
	G	3,897	"
	H	3,726	"
		9,000	
TOTAL		79,000	

The estimated raw materials required for each weight casting season are as follows:

Summer 1977		
Cement	16,250	tons
Sand	46,280	cubic yards
Aggregate	28,080	cubic yards
Weights Produced	26,000	
Summer 1978		
Cement	27,500	tons
Sand	78,320	cubic yards
Aggregate	47,520	cubic yards
Weights Produced	44,000	
Summer 1979		
Cement	5,624	tons
Sand	16,020	cubic yards
Aggregate	9,720	cubic yards
Weights Produced	9,000	
Totals		
Cement	49,375	tons
Sand	140,620	cubic yards
Aggregate	85,320	cubic yards
Weights Produced	79,000	

Applicant. Preference should be given to borrow pit locations or stockpiles. It is assumed that winter road transport would be used along the pipeline right-of-way as well as summer barge (Applicant's logistics) for delivery of weights to the required location.

The casting plant would supply weights FOB the plant. Each plant would also be expected to have cement and rebar available at adjacent or easily accessible (by land) stockpile sites.

It is entirely possible that five casting plants would be required for summer 1977, six plants for summer 1978, and three plants for summer 1979. Consideration was given to one or two central plants. However, under such a model, summer access to the point of use of the weights and the high cost of barge transport would add additional costs to weight casting oeprations. Backhaul rates on barge transport are not available due to the extra time and fuel required to move loaded barges against the Mackenzie current.

Although it is anticipated that the Mackenzie Highway will have additional completed sections by 1977, it is also felt that the majority of weights would be transported on winter roads on hauls not exceeding forty miles.

3.4 Casting Plant Facility

3.4.1 The System

The casting procedure for manufacturing the river weights is basically the same as for other precast products. In this case however, the quality of sand and aggregate would be controlled by the Applicant (his selection of borrow pit site).

The general procedure would be:

(a) assemble the form (mold) on pallet;
(b) place rebar and fittings;
(c) mix concrete;
(d) pour concrete into form;
(e) agitate fluid concrete during pour with rod to ensure complete fill;
(f) allow concrete to set (set time in form would usually be 24 hours);

(g) disassemble form;
(h) move weight (on pallet) to cure area for two to three days;
(i) stack weights in storage area (a 28 day cure time is usually required before use to ensure the concrete reaches its full material strength.

The design of the weight could take two forms. One is a two-piece unit (two halves) which are placed around the pipe and bolted together. The other is a single unit, not unlike a saddle, which is placed on the pipe in the ditch. In all probability the saddle unit will be used for the most part. A sketch of the saddle type of concrete river weight is shown in Exhibit III.

The mold itself would probably be at least 6 feet by 6 feet in cross section. The depth of the mold would be approximately 6 feet. Each of the river weights would weigh five tons and contain about 2.5 cubic yards of concrete.

If it is assumed that a typical plant would have a capacity of 6,000 precast concrete river weights, the following casting operation criteria are established:

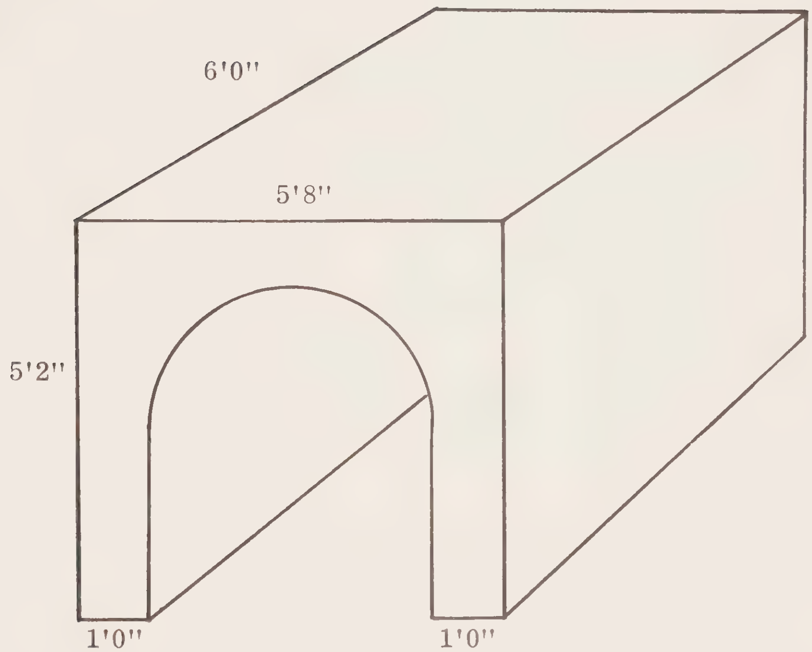
* Available Casting Days (based on a five-month casting schedule-May through September) a 6 day week casting @ 20% downtime	- 100 days
* Total Mold Casts Produced	- 6,000
* Mold Casts per day	- 60
* Volume of Cast	- 2.5 cu.yd. concrete
* Weight of Cast	- 5 tons
* Molds Required (extra molds needed as spares)	- 70 approximately
* Daily Molding Time	- 8 hours - 480 minutes
* Average Production Rate/Hour	- 7.5 weights
* Concrete Poured per Hour	- 18.75 cu.yd.
* Preferred Pouring Rate	- 24 cu.yd./hour (to allow for shut down caused by breakdown and inclement weather)

The actual production system, as illustrated by the sketch in Exhibit IV, would be as follows.

* Mixing would be accomplished in a large mobile 12 cubic yard batch concrete mixer. The mixer

EXHIBIT 3

POSSIBLE DESIGN OF CONCRETE RIVER WEIGHT
(by Applicant)

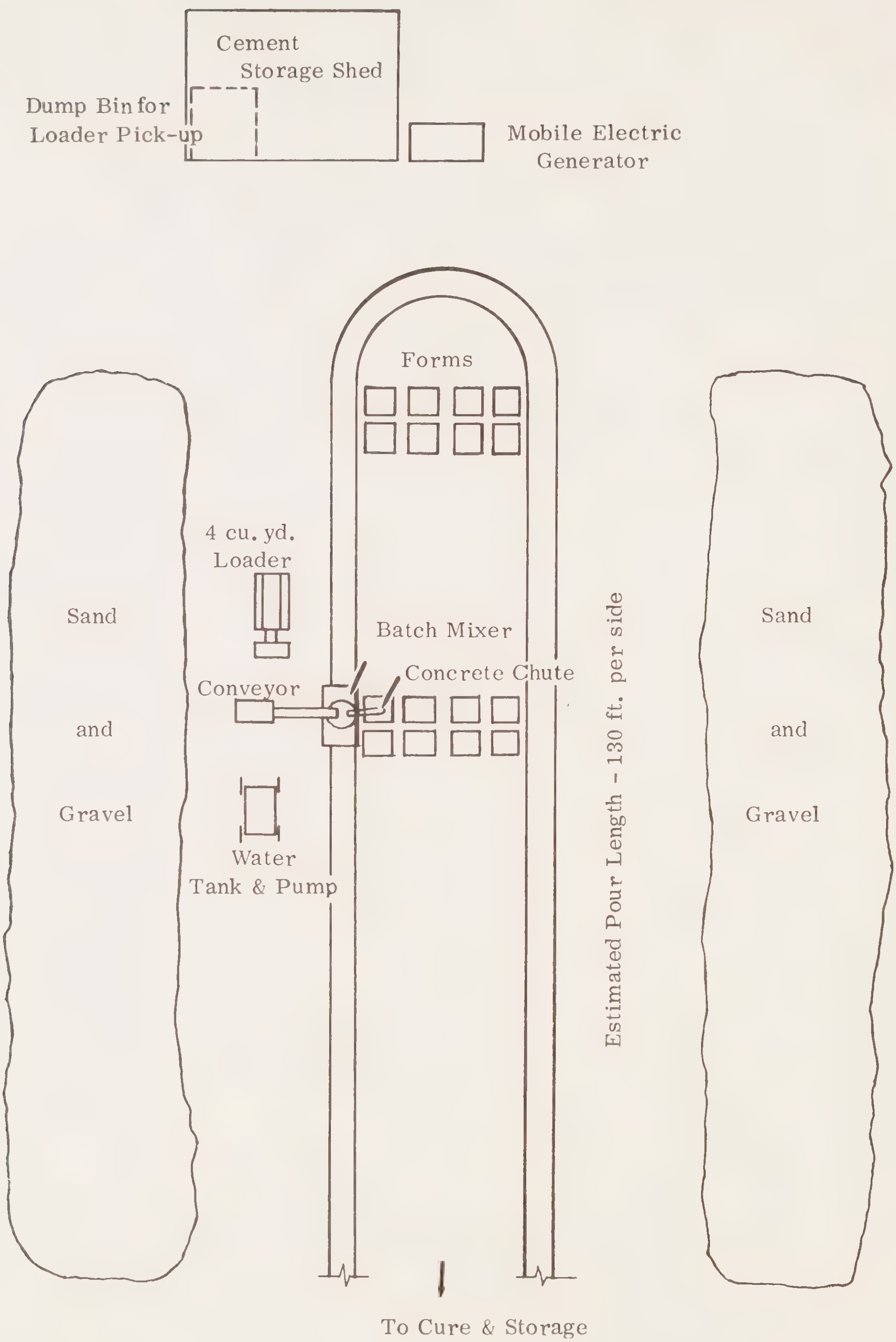


Approximate Specifications of River Weights

*	Size of Rebar	- 5/8"
*	Rebar Grid	- 6"
*	Concrete	- 2,500 p.s.i. @ 28 days
*	Weight	- 10,000 pounds
*	Volume of Concrete	- 2.5 cubic yards

EXHIBIT 4

SCHEMATIC LAYOUT OF CASTING PLANT



would be rail-wheel mounted to run on steel tracks (suitably tie-braced). The mixer would be diesel powered and able to swivel for dumping. Charging of the mixer would be by skip hoist or by a mobile conveyor. Water would be added by means of a pump and hose from a mobile water tank. Both conveyor (skip hoist) and pump would be electrically driven, power supplied from a portable diesel powered AC generator.

* The molds would be set up in two rows at two deep in a U-shape. Molds to be set up inside the legs of the "U", with the legs of the "U" representing the rail track.

* Sand and aggregate would be stored in the outside area of the track along the length of track.

* Loading would be by means of a front end loader to the hopper of the charging conveyor (both for concrete, sand and aggregate).

* Cement would be stored under cover in bulk containers. Containers of cement would be dumped into a storage stall (covered) for front end loader pick-up.

* Mixing would be by loader bucket units or portions thereof depending on the Applicant's specifications.

* Mixer would have extended dump chute to feed two deep mold configuration.

* Mixer to be moved along track with integral powered wheel from diesel engine.

* Charge conveyor and water tank to be moved by hand.

Once the required number of molds have been poured, cleanup operations take place. The next morning, an early shift, the mold crew, comes to disassemble the molds, move the "green" weights (on molding pallets) to the cure area, reassemble molds, insert rebar and prepare molds for that day's pour. When the pouring crew arrives for work, probably four hours after the mold crew, half of the days molds would be ready for pour. The mold crew would also be responsible for moving semi-cured weights (3-5 days old) to the storage area.

3.4.2 Cost of the System

3.4.2.1 *Equipment*

The equipment requirements and the estimated capital costs are outlined below.

* 1 mobile batch mixer with associated track, pour chutes and spares	$ 24,000
* 1 mobile belt conveyor with loading bin, electric drive, complete	6,000
* 1 mobile water tank with electric pump and hose	3,000
* 1 mobile diesel powered AC electric generator	2,000
* 70 steel molds for weights	50,000
* 350 mold pallets	15,000
* 1 four cubic yard diesel powered loader	60,000
* 1 bulldozer with blade, ripper and side boom (diesel)	90,000
* 1 diesel powered truck with flat bed trailer (40,000 lbs. capacity)	50,000
* 1 portable housing unit with cooking facilities, sanitary equipment, complete (this may be required if no on-hand living accomodation is available)	59,000
* 1 miscellaneous equipment for machine maintenance, welding, etc.	30,000
Total Capital Cost	$389,000

The expected write-off period for the operation would be two years, even though the equipment would have longer life and expected construction season could last as long as three years (Prudhoe Bay Section).

3.4.2.2 *Operating Expenses*

General operating expenses are difficult to assess when these expenses must cover fuels, lubricants, food, housekeeping, supplies, and general maintenance supplies. Included in this figure must be the cost of moving

the unit to a new site, preparing the site and setting up the equipment prior to the start of the summer casting season. The estimated cost would range between $50.00 to $100.00 per day. The feasibility costing is estimated at $80,000 per season.

3.4.2.3 *Labour*

Estimated labour requirements for the proposed casting plant facility are:

Number Required	Description	Hourly Rate
		$
1	Plant Superintendent	10.00
3	Heavy Equipment Operators	8.00
3	Mixer Crew	6.00
4	Mold Crew	6.00
3	General Crew (cook, utility)	5.00
14	Total Manpower	

Total labour expense for each season is estimated at $109,000. Relatively high wage rates were used to compete with high pipeline construction rates as well as to attract capable work force.

It is essential that basic maintenance skills are available and be a prerequisite for the heavy equipment operators. As this plant would probably be self-contained, all but major maintenance problems would be handled by plant personnel.

The success of the "Hire North" program in the training of the native people could result in the development of a labour pool of skills sufficient to meet the requirements of the casting plant. As such it may be possible to obtain staff from local communities in the area through which the highway project has passed.

The plant superintendent should have basic concrete forming skills and probably would be difficult to find in the North. The relatively high wage rate offered, however, should be sufficient to attract the five superintendents needed during the summer months from the supervisory ranks either employed by the Applicant during and winter months and/or from the South.

3.4.3 Operating Cost Projections

The operating costs and resulting price of the product are dependent on several factors:

* equipment will have a two year life;
* a Holding Company plus a Band plant ownership concept of operation;
* the plant would be semi-mobile but be stationary for a single casting season;
* the plant would be completely self-sustaining;
* the plant would be located at borrow sites or stockpile sites which would be most convenient for operations;
* transport of finished weights would be the responsibility of the Applicant;
* imported materials at Applicant's expense;
* there would be no site rental or lease charges.

The components of annual (seasonal, operating costs are as follows:

Capital and Interest Expense

(a)	Estimated Capital Costs of Equipment	$380,000
	Annual Interest Charges (a high rate of capital charges is required because of the short duration of the project)	12%
	Annual Interest Charges	$ 45,600
	Annual Capital Depreciation Allowance 'c'	$235,600
(b)	Working Capital	$ 50,000
	Working Capital for each season is estimated at	12%
	Annual Interest Charges	$ 6,000
	Annual Working Capital Allowance 'd'	$ 31,000
	Total Annual Depreciation and Repayment Allowance 'c' and 'd'	$266,000

Operating Expenses	$ 80,000

Labour Expense

Direct Labour Charge	$109,000
Fringe Benefits @ 9%	9,800
Total Labour Expense	$118,800

Total Annual Expenses ($80,000 + $118,800 + $266,600)	$465,400
Estimated Output of Weights per Season	6,000
Average Cost of Weights	$ 77.57/weight

However, there are additional expenses that must be covered:

* Administrative Expense
* Profit of 12% to 15%

If a Band plant ownership type of operation is established, it would be advisable that an administrative organization also be established to handle purchasing, payroll, accounting and general logistics for all the plants. If it is assumed that one or more of these plants are operated through a Holding Company, it is estimated that a reasonable administrative expense of $40,000 per plant per year would be required to cover the following (refer to section 3.6.2):

* administrative salaries;
* travel; and
* office expenses.

The number of support staff would depend on the number of plants undertaken.

Finally, an acceptable level of profit should be made on the operation. This profit could be used for local incentive in the form of capital assistance for the purpose of setting up small business enterprises once pipeline construction is completed.

3.5 Operating Revenue and Expense

The annual operating revenue and expense is shown in Table 7.

The Applicant has not been able to provide any indication as to the expected cost of the river weights. On the basis of the above costs and estimates on material costs, it is possible that the weights would cost the Applicant as shown in Table 8.

Table 7

Annual Operating Revenue and Expense for a Casting Plant

Volume Weights Cast	6,000
Estimated Selling Price per Weight (less cost of materials)	$ 100
Total Annual Revenue	$600,000
Labour Expense	$118,800
Operating Expense	80,000
Administrative Expense	40,000
Capital Charges Expense	266,600
Total Operating Expense	$505,400
Net Profit (before tax)	$ 94,600
Taxes @ 50%	47,300
Net Profit	$ 47,300

Net Profit (before tax)	15.8%
(after tax)	7.9%
Return on Investment (before tax)	24.9%
(after tax)	12.4%

Capital Requirements

Equipment	$380,000
Working Capital	$ 50,000

Table 8

Estimated Total Cost of River Weights (constant 1974 dollars)

Material Content Cost (per weight)	
Cement 0.625 tons @ $100/ton (average cost)	$ 62.50
Sand 1.78 cubic yards @ $4/cu.yd.	7.12
Gravel 1.08 cubic yards @ $6/cu.yd.	6.48
Casting Plant Price of Fabricating Weights	100.00
FOB Casting Plant Price	$176.10
TOTAL ESTIMATED FOB COST OF 79,000 RIVER WEIGHTS	$13,911,900.00

Costs of materials are estimates only. It is assumed that sand and gravel can be obtained in site. As the Applicant will be using vast quantities of sand and gravel for other uses (fill, plant sites, airstrips, etc.) than all borrow pit and quarry and crushing operations will be performed under contract for the Applicant.

At the contract price of $100.00 per weight, the project would appear to be feasible. Although no indication has been given by the Applicant as to the expected cost of the weights, under the assumed conditions, the price appears realistic.

There are advantages and disadvantages associated with this project:

Disadvantages

* it is of short duration;
* it provides work for only four to five months;
* it requires heavy capital investment;
* it requires a heavy administrative commitment on the part of the Holding Company.

Advantages

* it does provide additional opportunities for summer employment;
* it would generate $40,000 to $50,000 revenue per year per plant which would be used to finance native enterprises after the pipeline is built;
* it provides additional training opportunities for the native people;
* sale of equipment after use would provide not only additional capital return but possibly form the springboard for future concrete based or construction based activity in the North.

Should at least two to five of these plants be established the results could have a significant impact on the future development of the Mackenzie Corridor. Table 9 indicates the level of return on investment earned by the five plants operating over a two year period and thus revenues to the Bands which could be used to finance other entrepreneurial acitivites.

Table 9

Profits Earned for Future Capital Development (over the two years)

Number of Casting Plants	Investment Needs	Profits Earned for Future Capital Development
	$	$
1	380,000	88,000
2	760,000	176,000
3	1,140,000	264,000
4	1,520,000	352,000
5	1,900,000	440,000

3.6 Investment and Corporate Ownership

3.6.1 Investment

Undoubtedly, the Applicant either through its own organization or its sub-contractors would become directly involved in various suboperations such as the weight casting facilities associated with the construction of the pipeline. However, such a move would not benefit or provide for future development in the North as these funds would be funnelled south.

The level of investment required may be beyond the capability of local entrepreneurs, especially the Indian people, unless they had a source of ready capital. Such sources, particularly for such a short term operation, unless government supported, would be difficult to obtain in the Territories. It is suggested that the Department of Indian and Northern Affairs, via the Indian Economic Development Fund, provide capital for the financing of the project. This financing would probably be at a rate of 9% (although 12% was used in the calculations). Proceeds from the financing would then be used by the Bands for the construction of the plants.

The Applicant has also shown a considerable interest in the project and may be interested in participating jointly with the Government in funding the venture.

3.6.2 Corporate Ownership

The concept of a Holding Company and a Band plant ownership program could form the basis of the development of individual plant operations. These various operations would be linked at the so-called senior executive level. The overall corporate body (Holding Company) would provide administrative support services (accounting, technical, purchasing) for each of the individual plants operated by the Bands. The proposed corporate structure is shown in Exhibit V.

The Bands would be involved in the overall scheme and would register under a Band name for their particular company. Each of these registered companies would then, by virtue of loan agreements, become part of the N.W.T. Casting Corporation. A generalized outline of the functions of each level of the structure is described.

Board of Directors - The Board of Directors would provide overall operating policy, approve expenditures, and review operations and performance. It is expected that the Board of Directors would meet four times a year for the life of the Corporation: once or twice in mid-winter to establish operating criteria, approve contracts, etc.; once immediately prior to the start of operations; mid-way in each operating season; and again at the close of the season to review performance. The suggested composition of the Board would be:

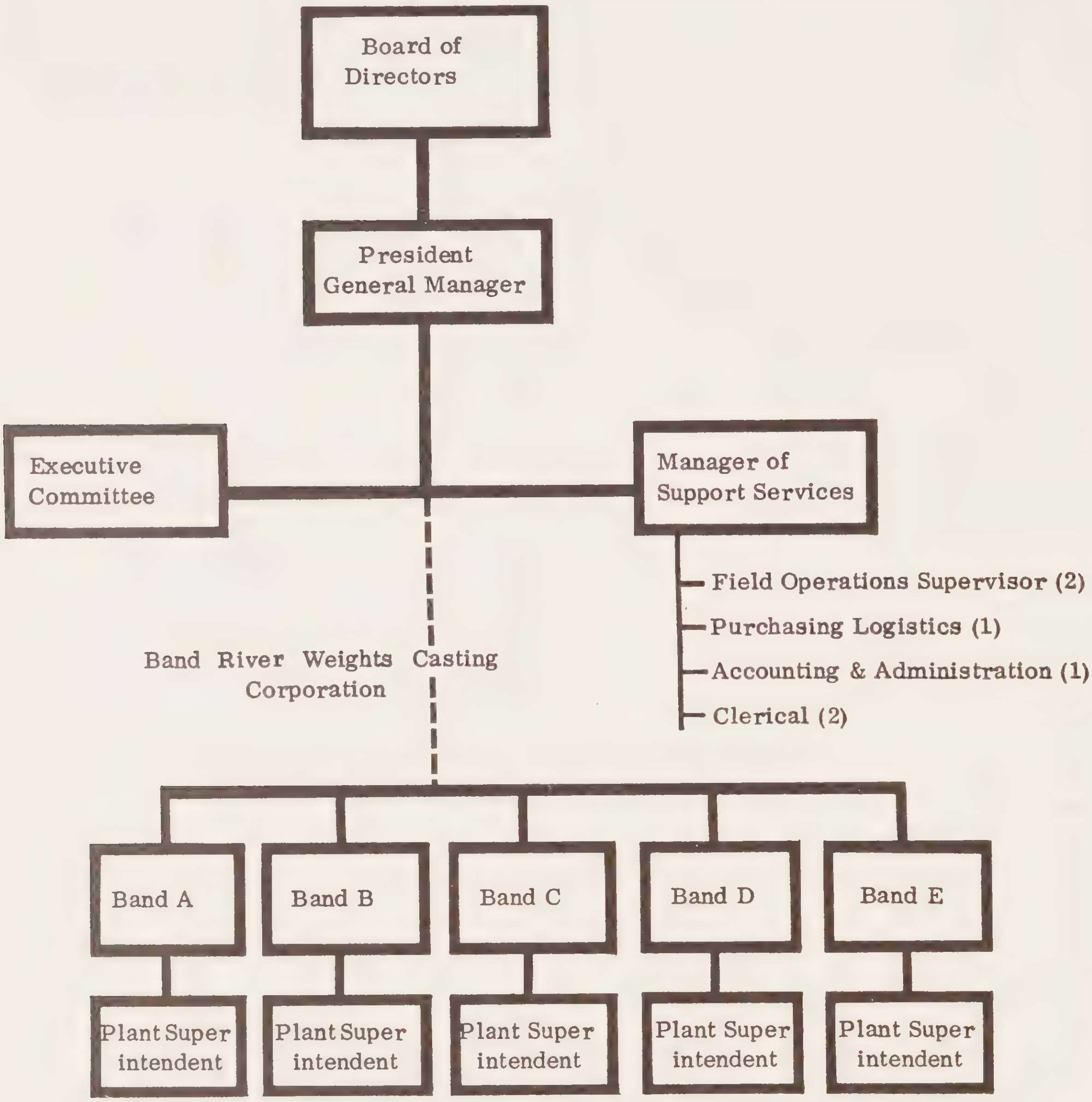
* Chairman - President/General Manager
* Members
  - Representative from INA
  - Representative from the Territorial Government
  - Representative from each Band plant

If the Applicant should get involved in the project from a funding point of view then, needless to say, he would have a representative on the Board.

President/General Manager - The President/General Manager would be appointed by the Board of Directors to act as the Chief Executive Officer with the full powers normally associated with company Presidents. He may be seconded from the Federal or Territorial Governments or hired on a project basis from outside. The individual must have experience in casting operations and be fully conversant with the North. He would be responsible for implementing policies and administrating all corporate objectives.

EXHIBIT 5

NWT CASTING CORPORATION (PROPOSED CORPORATE STRUCTURE FOR THE HOLDING COMPANY)



* Each Band would register their Corporations under their respective corporate ownerships.

The Executive Committee - This is a management committee composed of the President as Chairman, the Plant Superintendents, the Field Operations Supervisors, and the Manager of Support Services. The Committee would meet once before the season opens, during the season, and at the end of the season. The function of the Committee is to provide not only a direct information link with corporate operations but to review operating plans, budgets, logistics, and employment and support services associated with manufacturing activities.

Manager of Support Services - This individual either seconded from Government or hired on a contract basis from outside would head up the support services. He and his staff would provide technical advice, provide purchasing, logistics, personnel and training and administrative needs of the total operation.

Field Operations Supervisors - Individuals with concrete casting operations experience, would provide on-site technical and supervisory advice and direction to the respective Plant Superintendents assigned (two to three plants per Supervisor).

Plant Superintendent - He would be responsible for the operation of the plant. The individual could come from the Band, which is preferred. If this is not possible, then a contract Supervisor would have to be hired.

This proposed structure would provide the needed expertise at a corporate level in matters pertaining to technical, logistics and management; it also would provide the opportunity for the transfer of these skills to the management of each Band operation.

The structure does not provide for a direct financial investment on the part of each Band. However, ownership of the individual plant could be vested in each Band on the basis of the loan agreement, with each Band receiving its own earned profits generated from the plant at the end of the project.

3.7 Implementation

On a project of this size, with the capital investment involved and the logistics problems that would be encountered, a great deal of planning effort must be

expected. The key, of course, is the availability of competent individuals who could be hired or seconded to both the senior and middle management positions.

The timing of the project depends, of course, on the approval of the Applicant's proposal to build the pipeline. Steps must be taken prior to this date, in further analysis, to prove out the concepts outlined in this report. A suggested program is outlined as a guide for implementation.

3.7.1 Prior to Pipeline Approval

(a) Approval in principal by both the Federal and Territorial Governments of the concept of the proposal.

(b) Agreement in principal as to feasible financing of the project and the source of funds.

(c) The establishment of a project review office, hopefully headed by the future President/General Manager to make an in-depth technical and economic analysis of the project and to develop preliminary plans of action.

(d) A commitment by both the Federal and Territorial Governments to undertake their proposed share of implementation (plus possible involvemnt of Applicant).

(e) Review of proposals with selected Bands and a commitment from each Band to participate.

(f) Preliminary approval from the Applicant for the commitment in principle to the issuance of weight casting contracts to the Corporation.

3.7.2 Following Pipeline Construction Approval

(a) Incorporation or registration of the Holding Company and each Band company and appointment of the Board of Directors.

(b) Selection of senior Holding Company staff (particularly technical and skilled people). The numbers of staff required are estimated to be between six and ten for a three to five

plant organization. However, this will depend upon the results obtained from the in-depth analysis.

(c) Securing of orders for weights from the Applicant.

(d) Selection and ordering of equipment.

(e) Training of plant staff.

(f) Preparation of first year's site.

(g) Installation of equipment and prove-out.

(h) Commence assembly.

The above outline is by necessity quite broad in concept. Detailed planning will, of course, flesh out the sequence of events indicated. The preliminary costs of evaluation and to some extent the Government absorbed costs of operation were not estimated. On this preliminary analysis, it does look favourable for such a project, particularly when an opportunity exists for the native people to develop entrepreneurial qualities with investment capital from their own efforts.

3.8 Other Opportunities

One opportunity that was identified during the study of river weights manufacturing was the fabrication of molds for the weight casting plants. A preliminary analysis indicates that between 300 and 350 molds would be required. These molds (or forms) would be fabricated from steel plate and would probably cost about $700.00 each including material. Thus a total potential sales volume of between $210,000 and $245,000 is possible.

The fabrication of these molds would require normal metal fabricating machinery. This could very well be an additional opportunity for a metal fabricating enterprise in the Mackenzie Valley.

4. THE ENTREPRENEURIAL OPPORTUNITY FOR THE MANUFACTURE OF PRECAST CONCRETE PRODUCTS

4.1 Introduction

Precast concrete products encompass a wide range of products, some of which could be feasible under the right combination of market size, materials input prices and transportation charges. Another consideration in terms of market impact is the problem associated with the use of precast concrete products in those areas where permafrost conditions could make it impractical in a construction integrity sense, i.e. structural instability.

There is, however, a major influence that could make many concrete products attractive to the Territorial market, for example, the almost total lack of locally produced building products other than some dimensioned lumber and concrete redi-mix plants. Almost all structural products, steel, concrete block, panelling, siding, etc. are imported to the Northwest Territories at a considerable expense due to high transportation charges.

Some of the precast concrete products to be considered in this section are:

* building blocks;
* bricks;
* curbing;
* steps;
* patio slabs;
* sidewalk slabs;
* sewer and water pipe;
* sewer manhole components.

4.2 The Market Areas

The market for concrete products is dependent on three major considerations:

* building and construction considerations;
* transportation; and
* population.

4.2.1 Building and Construction Criteria

Much of the area north of the 60th parallel is affected by permafrost ground conditions which makes most precast products highly questionable building components. This is due to the settling of foundations as permafrost thaws and/or freezes. There is an area however, basically around Great Slave Lake, where precast concrete building components could be used and in fact are presently used to a limited extent.

This area extends south from Fort Simpson and Yellowknife including the major towns of Hay River, Pine Point and Fort Smith. It is in this area that building contractors and municipal engineers believe that should precast concrete building components be available at a reasonable price, their use as a building component could greatly increase.

There was some question, however, on the use of precast concrete sewer and water pipe in this area even though it was felt that the engineering problems could be overcome. It was generally felt that, in this area, the present systems of using corrugated steel sewer pipe and asbestos transite type water pipe would continue to be used primarily because of permafrost and construction conditions and the high cost of transporting heavy concrete pipe sections long distances.

4.2.2 Transportation

Much of the Slave area, including Fort Simpson, is accessible by at least two modes of ground transportation. Air transport is excluded due to its high freight rate structure. Hay River and Pine Point have rail access which is primarily a north-south route. The rail connection between Hay River and Pine Point, however, could be of some minor importance for the movement of goods produced in Hay River. However, water and road transport is available with road access being an all year mode. Although the Mackenzie Highway is being pushed north of Fort Simpson, it is doubtful that concrete products would find a significant market above Fort Simpson due to permafrost problems.

4.2.3 Population

Within the vast area of the Northwest Territories the major concentration of population is in the area south

from Fort Simpson and Yellowknife. Exhibit VI shows the area of population concentration.

Table 10 shows the population of the major communities in the area and the estimated population growth to 1981 with and without the pipeline. As shown by the table, the impact of the pipeline on population in this area in 1981 would result in an overall increase of 10% to 28,297 from 25,596; not a particularly large market when distance between localities is considered as shown in Table 11.

Table 10

Population Great Slave Area

Community	1971 Census (NWT)	1975 Projected (NWT)[1]	1981 (Gemini North Estimate) No Pipeline	1981 (Gemini North Estimate) With Pipeline
Yellowknife	6,122	7,836	10,428	10,428
Rae/Edzo	1,081	1,254	1,690	1,690
Fort Providence	587	681	934	953
Fort Simpson	747	1,470	1,449	2,904
Jean Marie River	47	51	72	65
Hay River	2,406	3,734	4,336	5,570
Enterprise	56	65	80	80
Pine Point	1,255	1,556	2,116[1]	2,116[1]
Fort Resolution	623	723	897[1]	897[1]
Fort Smith	2,364	2,742	3,594	3,594
Totals	15,288	20,112	25,596	28,297

[1]Based on projected NWT Government estimates.

4.3 The Market - Present Size

4.3.1 Concrete Block

Concrete block is now being imported into the area by firms in Edmonton and Grand Prairie. Data obtained from the two major importers are shown in Table 12, as well as estimates made from information supplied by these manufacturers. The figures indicate a relatively stable market considering the cost and construction problems discussed earlier. In fact concrete block has been used to some noticeable extent both in Yellowknife and Hay River, particularly in the case of the new motel and fish plant in Hay River.

EXHIBIT 6

MARKET AREA FOR PRECAST CONCRETE PRODUCTS

Table 11

MILEAGE CHART

ROAD MILES	Edzo	Enterprise	Ft. Resolution	Ft. Simpson	Ft. Smith	Hay River	Junction 1 & 3	Junction 2 & 5	Junction 5 & 6	Kakisa	Kakisa Junc. & 1	Mackenzie River Ferry	Pine Point	Providence	Providence Junc. & 3	Rae	Rae Junction & 3	60th Parallel	Yellowknife
Edzo	---	215	329	330	400	242	150	234	272	166	162	134	286	134	130	10	3	276	65
Enterprise	215	---	114	245	185	27	65	19	57	57	53	81	71	89	85	225	218	52	280
Ft. Resolution	329	114	---	359	185	103	179	95	57	171	167	195	43	203	199	339	332	166	394
Ft. Simpson	330	245	359	---	430	272	180	264	302	196	192	196	316	204	200	340	333	297	395
Ft. Smith	400	185	185	430	---	174	250	166	128	242	238	266	142	274	270	410	403	237	465
Hay River	242	27	103	272	174	---	92	8	46	84	80	108	60	116	112	252	245	79	307
Junction 1 & 3	150	65	179	180	250	92	---	84	122	16	12	16	136	24	20	160	153	117	215
Junction 2 & 5	234	19	95	264	166	8	84	---	38	76	72	100	52	108	104	244	237	71	299
Junction 5 & 6	272	57	57	302	128	46	122	38	---	114	110	138	14	146	142	282	275	109	337
Kakisa	166	57	171	196	242	84	16	76	114	---	4	32	128	40	36	176	169	109	231
Kakisa Junc. & 1	162	53	167	192	238	80	12	72	110	4	---	28	124	36	32	172	165	105	227
Mackenzie River Ferry	134	81	195	196	266	108	16	100	138	32	28	---	152	8	4	144	137	133	199
Pine Point	286	71	43	316	142	60	136	52	14	128	124	152	---	160	156	296	289	123	351
Providence	134	89	203	204	274	116	24	108	146	40	36	8	160	---	4	144	137	141	199
Providence Junc. & 3	130	85	199	200	270	112	20	104	142	36	32	4	156	4	---	140	133	137	195
Rae	10	225	339	340	410	252	160	244	282	176	172	144	296	144	140	---	7	277	69
Rae Junction & 3	3	218	332	333	403	245	153	237	275	169	165	137	289	137	133	7	---	270	62
60th Parallel	267	52	166	297	237	79	117	71	109	109	105	133	123	141	137	277	270	---	332
Yellowknife	65	280	394	395	465	307	215	299	337	231	227	199	351	199	195	69	62	332	---

Junc. 1 & Ft. Liard Hwy. to end of Ft. Liard Hwy. 29 miles
Yellowknife to Tibbett Lake (End of Highway 4) 40 miles.

Table 12

Shipments of Concrete Block to Great Slave Area in Numbers of 8 Inch Equivalent Block

	1972	1973	1974 6 months
Edcon (Edmonton, Grand Prairie)	50,000	27,000	26,000
National Block	35,000	35,000	5,000
Other (estimated)	5,000	5,000	2,500
Total Number of Block	90,000	67,000	33,500
Probable 1974 Total Figure			70,000

On the basis of these data, the per capita usage of concrete block in the market area would be as shown in Table 13.

Table 13

Per Capita Usage Concrete Block N.W.T. - Great Slave Market Area

	1972	1973	1974 Est.
Concrete Block Used	90,000	67,000	70,000
Estimated Population	16,400	17,600	18,900
Per Capita Usage	5.9	3.81	3.70

Data obtained from Statistics Canada, as shown in Table 14, show the per capita use of concrete block in other areas of Canada. A comparison of Tables 13 and 14 shows that the Great Slave area demand per capita is less than that experienced in Alberta.

It is true that location and concentration of population has a significant effect on usage. However, it is also true that given an attractive price compared to other building products, the use of concrete block could gain a significantly larger share of the potential Territorial market.

Table 14

Per Capita Use of Concrete
Block (8 inch Equivalent Units)

Province	1969	1970	1971	1974[1]
Alberta	10.40	9.44	8.39	9.00
Ontario	18.96	15.23	17.23	17.00
British Columbia	7.30	5.20	6.25	6.00
Quebec	7.48	8.35	8.33	8.00
Other Provinces	6.19	4.99	4.53	5.00

[1]Estimate based on relatively stable growth pattern indicated by manufacturers in Alberta.

4.3.2 Concrete Brick

No data were available for the use of concrete brick in the Great Slave area. From observations, it appears that very little concrete brick is used. Statistics Canada, however, provided data on the use of concrete brick in other areas of Canada as shown in Table 15.

Table 15

Per Capita Use of Concrete Brick
Other Areas of Canada
(whole brick equivalent units)

Province	1969	1970	1971	1974[1]
Alberta	3.94	2.49	4.09	3.50
Ontario	10.72	11.12	17.43	15.00
British Columbia	8.95	9.00	10.85	9.00
Quebec	5.09	8.99	10.29	9.00
Other Provinces	2.75	1.61	2.75	2.00

[1]Estimate based on the same premise as for concrete block.

Although the market for this product is not large, the use of the concrete brick as an architectural wall facing could replace the more traditional clay brick.

4.3.3 Other Precast Products (excluding prestressed, structural and architectural precast products)

This classification would include such products as steps, patio slabs, sidewalk slabs, curbs, chimney flues, etc. The per capital use in Canada is shown in Table 16 in dollars per capita.

Table 16

Per Capita Use of Other Precast Products in Canada
(dollars per capita)

	1969	1970	1971	1974[1]
	$	$	$	$
All Canada	2.43	2.34	2.56	2.50

[1]Estimate based on the same premise as for concrete block.

Again, there is a relatively small market primarily in areas of large population. However, the cost of entering the market appears relatively small.

4.3.4 Concrete Sewer and Water Pipe

Because of the construction problems with underground facilities, due to permafrost north of the 60th parallel and the relatively low market value in the rest of Canada (approximately $3.25 per capita), this product line was excluded from consideration. In addition, the high cost of capital equipment (i.e. spun concrete pipe machinery) and transportation costs of product would make the product non-competitive in terms of corrugated sectional pipe and other lighter weight products.

4.4 Market Projection

4.4.1 Building Construction Activity

Data supplied by the municipalities of Yellowknife, Hay River and Fort Smith on construction activity give some indication of the growth in this area for the last three

years. These data are shown in Table 17.

Table 17

Building Construction Selected Communities[1]
($'000)

Community	Estimated Population 1973	Residential 1971	Residential 1972	Residential 1973	Apartments/ Commercial/ Industrial 1971	Apartments/ Commercial/ Industrial 1972	Apartments/ Commercial/ Industrial 1973
		$	$	$	$	$	$
Yellowknife	(7,500)	4,207	2,010	1,713	3,345	6,913	7,385
Hay River	(3,500)	541	94	1,726	2,188	4,901	5,076
Fort Smith	(2,500)	-	223	1,094	-	926	1,158
Total	(13,500)	4,748	2,327	4,533	5,533[1]	12,740	13,619

[1]Yellowknife and Hay River only

Note: Data from other communities not readily available.

As can be seen from Table 17 the construction of apartments, commercial and industrial buildings is growing quite rapidly in the three areas where data were available. It seems reasonable to assume that this activity should continue to increase particularly in those areas affected by the pipeline over the short term.

A reasonable assumption would be that concrete products, if produced at a competitive price, could take a greater share of the building products market than experienced at this time. There would probably be a small demand for concrete products for residential building but this market would appear better served by the prefabricated and modular building product market.

In 1973 with an estimated population for the three communities of 13,500 and a total building construction activity of $18,152,000 or $1,345 per capita, the total building construction activity in the market area would probably be about $24,000,000 using an estimated population of 17,600. Keeping in perspective the degree of reliability of the figures, building construction by 1981 could be in the range of $30 to $40 million.

Given an acceptance of precast concrete building products by private and public architects and building

authorities, assuming price and quality is acceptable, these building products could prove to be a major component in construction north of the 60th parallel.

4.4.2 Estimated Market Volume

For the purpose of this study, three classes of products are considered:

* concrete block;
* concrete brick; and
* precast concrete products.

4.4.2.1 *Concrete Block*

At the present time a light weight concrete block (weight approximately 28 to 30 lbs.) is imported from Alberta. Because of the absence of light weight aggregate (expanded shale, clay etc.) a heavy weight block (weight approximately 38 to 40 lbs.) would be more practical for Northwest Territory manufacture.

Assuming a per capita use of block similar to that of Alberta (price and quality standards being attractive) the possible market volume could be as shown in Table 18. (The projected figures assume an attractive competitive price and equivalent quality.)

Table 18

Forecasted Use of Concrete Block (8" Equivalent) Great Slave Area

	1973	1974	1975	1981 No Pipeline	1981 With Pipeline
Population	17,600	18,900	20,112	25,596	28,297
Per Capita Use	3.81	3.70	5.00	9.00	9.00
Units (8" equivalent approximately)	67,000	70,000	100,500	230,000	255,000

4.4.2.2 *Concrete Brick*

As this product is not in general use at the present time a market projection is more difficult to

make. However, based on the Alberta experience with a small increase for price competitiveness the possible market could be as shown in Table 19.

Table 19

Forecasted Use of Concrete Brick
Great Slave Area

	1973	1974	1975	1981 No Pipeline	1981 With Pipeline
Population	17,600	18,900	20,112	25,596	28,297
Per Capita Use	3.50	3.50	3.50	5.00	5.00
Units (approximately)	62,000	66,000	70,400	128,000	141,000

4.4.2.3 *Precast Concrete Products*

This class of products (steps, slabs, etc.) is even more difficult to assess due to the long haul requirements from a central point. At best this product would be a fill-in job using small forms and a suitable vibrating table for make-up. It is possible that this market could reach $50,000 to $60,000 per year by 1981 assuming a per capita consumption of $2.00 (80% of national average).

In addition to these products, a job shop operation could be undertaken to precast structural and architectural reinforced concrete products on a job lot basis.

4.5 Competition

4.5.1 Concrete Block

The major competition for concrete block would be in the Grand Prairie and Edmonton areas of Alberta. The landed price per block, showing estimated FOB cost, freight and destination for light weight block, is shown in Table 20. Exhibit VII is a list of existing concrete block and brick manufacturers in Alberta and Northeast British Columbia. In many cases, these companies produce precast concrete products as a secondary line to the block operations.

EXHIBIT 7

EXISTING MANUFACTURERS OF CONCRETE BLOCK AND BRICK

ALBERTA AND NORTHEASTERN BRITISH COLUMBIA
(July 1974)

* Consolidated Concrete Limited,
  Calgary, Alberta

* Du Al Blocks (1967) Ltd.
  Edmonton, Alberta

* Elcon Block, Division of Consolidated
  Concrete Ltd.,
  Edmonton, Alberta

* Lethbridge Concrete Products Ltd.,
  Lethbridge, Alberta

* Masonry Concrete Products Company,
  Calgary, Alberta

* Proctor Concrete Products Ltd.,
  Calgary, Alberta

* St. Paul Concrete Products Ltd.,
  St. Paul, Alberta

* Tremblay Concrete Products Ltd.,
  Dawson Creek, B. C.

* National Concrete Block Co. Ltd.,
  Edmonton, Alberta.

* Northwest Concrete Grande Prairie Ltd.,
  Grande Prairie, Alberta.

* Superior Masonry Products Ltd.,
  Lethbridge, Alberta

* Toews Building Blox,
  Linden, Alberta

* Alberta Dunbrick Co. Ltd.,
  Calgary, Alberta

* Drury's Masonry and Stucco Ltd.,
  Lloydminster, Alberta

* Edmonton Concrete Block Co. Ltd.,
  Edmonton, Alberta.

Table 20

Estimated Laid Down Price of Standard 8" Concrete Block
(cost in cents per block)

Destination	FOB Price	Freight Cost Per Block[1] Rail Direct	Truck Direct	Barge Direct	Rail Truck[2]	Rail Barge[3]	Total Least Laid Down Price
	¢						
A. *Light-Weight Block - Source: Edmonton, Alberta*							
Hay River	40.00	45.92*	63.66	-	-	-	85.92
Yellowknife	40.00	-	87.08	-	88.40	77.56	117.56
Rae/Edzo	40.00	-	82.32	-	73.64*	-	113.64
Fort Providence	40.00	-	77.56	-	67.20*	73.64	107.20
Fort Simpson	40.00	-	82.32	-	75.60*	85.68	115.60
Jean Marie River	40.00	-	-	-	n.a.	85.68*[4]	125.68
Enterprise	40.00	45.92*	63.56	-	n.d.	-	85.92
Pine Point	40.00	51.00*[5]	68.88	-	62.16	-	91.00
Fort Resolution	40.00	-	77.56	-	71.40*	73.64	111.40
Fort Smith	40.00	-	82.32	-	69.72*	91.00	109.72
B. *Light-Weight Block - Source: Grand Prairie Alberta*[6]							
Hay River	42.00	26.04*	51.80	-	-	-	68.04
Yellowknife	42.00	-	77.56	-	68.52	57.68*	99.68
Rae/Edzo	42.00	-	77.56	-	53.76*	-	95.76
Fort Providence	42.00	-	57.68	-	47.32*	53.76	89.32
Fort Simpson	42.00	-	77.56	-	55.72*	65.80	97.72
Jean Marie River	42.00	-	-	-	-	65.80*[4]	107.80
Enterprise	42.00	26.04	51.80	-	n.d.	-	68.04
Pine Point	42.00	28.92*[5]	57.68	-	42.28	-	70.92
Fort Resolution	42.00	-	66.08	-	51.52*	53.76	93.52
Fort Smith	42.00	-	66.08	-	49.84*	71.12	91.94

[1]Weight: 28 lbs.; freight based on 40,000 lb. shipments; quality discounts available (est. 5 to 10%).

[2]Excludes terminal handling charges.

[3]Includes 25¢/100 lbs. terminal charges (28 lb. block @ 7.0¢ per block).

[4]Estimated as same as Fort Simpson.

[5]Estimate.

[6]Rail rate based on 89¢/cwt for 60,000 pound load adjusted to 93¢/cwt for 40,000 pound load.

*designates least cost freight.

n.d. - no data.

As can be seen from Table 20, the majority of least cost combinations are the rail truck combinations except for Yellowknife and Jean Marie River. In all probability, because of schedules and weather restrictions on barge operations, most of the product would be moved either by truck direct or by rail-truck combination. As the data in the table for rail-truck do not include inter-modal handling costs, estimated at around 7¢ per block, most of the transport would in all probability be handled by truck transport direct. Further comparisons will be shown only for direct truck transport. Table 21 shows the comparison between Edmonton and Grand Prairie sources for the price of concrete block laid down at destination.

Table 21

Comparison of Laid Down Price - Light-Weight Block, Edmonton and Grand Prairie to Destination, Truck Transport Only

Destination	From Edmonton Price	From Edmonton Laid Down Price	From Grand Prairie Price	From Grand Prairie Laid Down Price
	(¢/Block)	(¢/Block)	(¢/Block)	(¢/Block)
Hay River	40.00	103.66	42.00	93.80
Yellowknife	40.00	127.08	42.00	119.56
Rae/Edzo	40.00	122.32	42.00	119.56
Fort Providence	40.00	117.56	42.00	99.68
Fort Simpson	40.00	122.32	42.00	119.56
Jean Marie River	40.00	n.a.	42.00	n.a.
Enterprise	40.00	103.56	42.00	93.80
Pine Point	40.00	108.88	42.00	99.68
Fort Resolution	40.00	117.56	42.00	108.08
Fort Smith	40.00	122.32	42.00	108.08

As illustrated, transportation costs make up the major proportion of the final laid down price of the concrete block. This provides a significant competitive advantage should the Territorial market be large enough to support a block manufacturing operation.

4.5.2 Concrete Brick

A standard cement lighweight brick weighs 3½ pounds per brick. The price of the brick FOB Edmonton is $78.00 per 1,000 or 7.8¢ per brick. A comparison of laid down prices

at destinations from Edmonton using truck transport is shown in Table 22.

Table 22

Laid Down Prices for Cement Brick From Edmonton (40,000 lb. load)

Destination	FOB Price (¢/Brick)	Laid Down Price (¢/Brick)
Hay River	7.80	15.75
Yellowknife	7.80	18.69
Rae/Edzo	7.80	18.09
Fort Providence	7.80	17.50
Fort Simpson	7.80	18.09
Jean Marie River	7.80	n.a.
Enterprise	7.80	15.75
Pine Point	7.80	16.41
Fort Resolution	7.80	17.50
Fort Smith	7.80	17.50

Similarly to concrete block, transport charges for cement brick could provide a competitive advantage to a locally produced product.

4.5.3 Precast Concrete (Other) Products

Precast concrete products are basically a local industry. The market is small and no single individual in the major areas other than Transit Redi-Mix Ltd. in Yellowknife attempt such an operation. As this would be a "fill-in operation" at best, with minimum capital, little market competitive data are available.

4.5.4 Competitive Market Strategy

In order to meet existing competition and to make concrete products (block and brick) an attractive building alternative, pricing policy should provide an incentive, primarily in the apartment, commercial and industrial areas. Because the proposed block operation will be producing a heavy, weight block (made of stone aggregate) rather than a light, weight block (made primarily of expanded shale, clay and other light-weight aggregates), transport costs will be

higher due to extra weight. However, the heavy-weight block does have a higher resistance to the passage of water through the block and can be used, properly finished, as a completed finished wall.

Quality of all products must be comparable to that produced in larger plants in the South. The combination of quality and price will determine the volume of products that can eventually be sold. If the quality is good and the price attractive, there is no reason why locally produced concrete products could not make significant in-roads into the share of the building products market presently going to other materials.

4.6 Manufacturing Facility

The manufacture of precast concrete products is basically a simple operation. Sand and gravel are mixed with cement and water, placed in molds, allowed to set, removed from the mold, cured by the application of heat and then stored for a number of days so that the chemical reaction of the cement can be completed to give a very strong structural product. In some cases, reinforcing steel is embedded in the product during manufacture to provide additional strength.

4.6.1 Concrete Block and Brick

The manufacture of concrete block and brick is a highly mechanized operation. In large, high volume plants, sophisticated and rather expensive machinery is used to provide high hourly output rates. The general process is as follows:

* mix cement, sand, stone aggregate and water;
* transfer mixture to the vibrating type forming machine;
* transfer former blocks to a kiln rack and place in kiln;
* allow blocks in kiln to set for a minimum of two hours;
* cure the block by closing the kiln and steaming under low pressure for 2 to 2½ hours (a one-degree rise in temperature per minute to a maximum of 170 degrees is recommended);

* soak the blocks in the kiln for eight to ten hours;
* dry the blocks—either by removing the blocks from the kiln and air drying or apply dry heat while in the kiln for two to three hours;
* transfer blocks from kiln, take off racks, cube the block and store (outside) for two to fours weeks (often less time is provided for yard storage due to demand).

4.6.2 Other Precast Products

The procedure in manufacturing this group of products is fairly simple.

* Place mold on vibrating table.
* Mix concrete and pour into mold during vibration.
* Add reinforcing if required (may be added prior to pour).
* Let product set two to four hours.
* Strip from mold.
* May be air-cured or done in same way as block.
* Remove product to yard storage for final set.

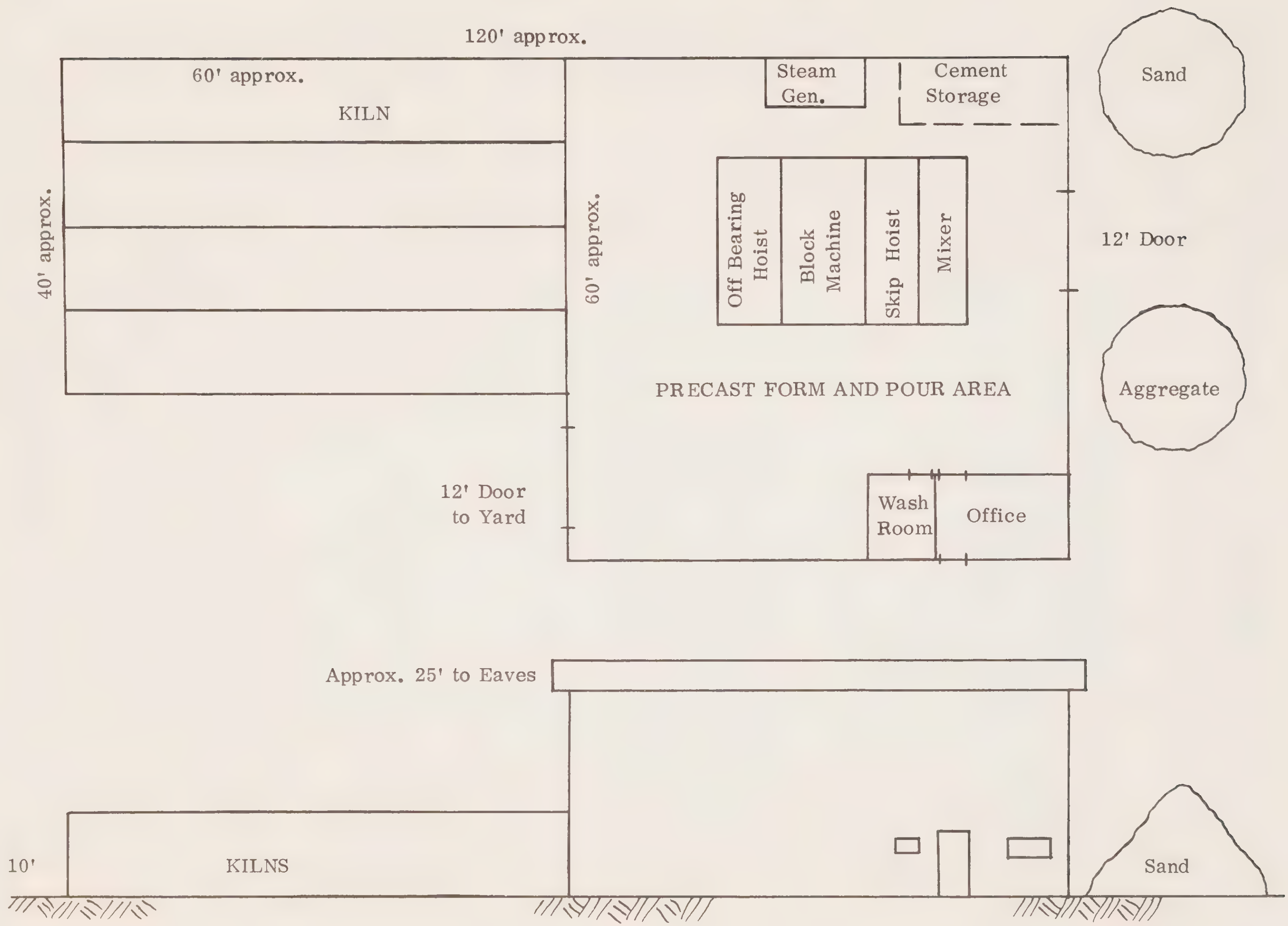
4.6.3 Building Size and Configuration

In order to provide sufficient space for forming operations (concrete block and other products, a basic, insulated rectangular building of approximately 60 feet by 60 feet outside dimensions with a minimum of 25 foot eave height would be required. Added to this would be four 60 foot long kilns (insulated) approximately 8 feet high and 8 feet wide.

* Estimated Cost of Forming Building (60' x 60' x 25') insulated, concrete floor and utilities @ $15.00 per square foot (3,600 sq.ft.)	$54,000
* Estimated Cost of Kilns (4 @ 60' x 8' x 8') parallel construction concrete floor, insulated @ $10.00 per square foot (2,040 sq.ft.)	20,000
Estimated Total Building Cost Complete	$74,000

EXHIBIT 8

SCHEMATIC OF SUGGESTED CONCRETE PRODUCTS PLANT



NOTE: See Exhibit VIII for sketch of building.

4.6.4 Land Requirements

Serviced land (water, sewer, etc.) of approximately 300 feet by 400 feet is required (minimum) to provide for sand and gravel storage, yard storage of finished product and building location.

* Estimated cost of land with total gravel surface	$25,000

4.6.5 Equipment

4.6.5.1 *Concrete Machinery (block and brick)*

Due to the relatively low output volume required, it is recommended that low volume used machinery be obtained wherever possible. Estimated prices, therefore, are for used equipment landed in the northern location.

	$
* one 50 cubic foot mixer (used)	3,500
* one block forming machine with conveyorized pallet return (used)	5,000
* one skip loader (mixer to former) (used)	2,500
* one off-bearing hoist to transfer block on pallets to racks (used)	1,000
* 40 block pallet racks made locally @ $120.00 each	4,800
* 1,200 steel plate pallets (26" by 18½") @ $10.00 each	12,000
* one front end loader with rear loading boom and forks (used)	5,000
* one hydraulic manual pallet truck (new)	700
* one 20 h.p. air compressor (new)	3,000
* one low pressure (15#) boiler (used)	10,000
* miscellaneous tools and equipment	1,500
Total Estimated Equipment Cost	49,000

Total output per hour for this equipment is approximately 600 - 8 inch equivalent concrete blocks

per hour at a rate of three blocks per machine stroke. However, pallets and racks are recommended for six hour production providing for two hours of set up and molding other precast products.

4.6.5.2 *Other Precast Products*

Mixing machinery, product handling, equipment and miscellaneous tools and equipment identified under sub-section 4.6.5.1 are suitable for this phase of the operation. The only piece of equipment that would be required is a vibrating table for form filling operations.

One only vibrating table (size 12' x 6') $2,600

4.6.6 Molds (Product Forms)

4.6.6.1 *Concrete Block and Brick*

It is suggested that only a basic number of products be manufactured in the initial stages. In fact, most molds would be multiple cavity with two or more different product configurations in each. In some cases, the molds can be provided with replacement "cores" and "cavities".

A possible list of products and molds is shown in Exhibit IX. Exhibit X shows some of the products that could be made.

Capital cost of molds as noted for products in Exhibit IX $25,000

This would be the minimum number required to start. Additional molds would be required eventually to broaden the product line.

4.6.6.2 *Other Precast Products*

The suggested list of products for precast product lines is shown below:

* Sidewalk Slabs (reinforced);
* Patio Slabs (reinforced);
* 8 foot Vehicle Curbs (reinforced);
* Chimney Casing;
* Small Wall Panels (reinforced) to design requirements.

EXHIBIT 9

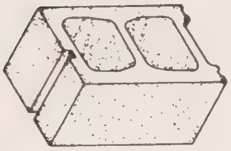
SUGGESTED PRODUCTS FOR CONCRETE BLOCK/BRICK

1.	Stretcher Block	Sizes (nominal)	4 x 8 x 16 inches 6 x 8 x 16 inches 8 x 8 x 16 inches 10 x 8 x 16 inches
2.	Single Corner Block	Sizes (nominal)	4 x 8 x 16 inches 6 x 8 x 16 inches 8 x 8 x 16 inches 10 x 8 x 16 inches 12 x 8 x 16 inches
3.	Brick	Sizes (nominal)	$2\frac{1}{4}$ x 4 x 8 inches
4.	Sun Screens (Decorative)	Two types	4 x 12 x 12 inches

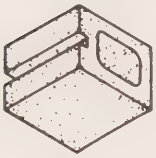
Estimated Number of Molds	7
Estimated Number of Replacement Cores and Cavities	5 sets
Estimated Cost of Molds and Parts	$25,000.

EXHIBIT 10 (a)

No. 1 STANDARD
4 x 8 x 16
6 x 8 x 16
8 x 8 x 16
10 x 8 x 16
12 x 8 x 16

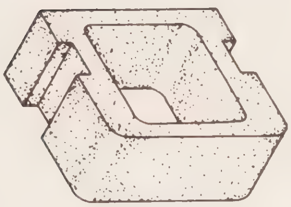


No. 2 CORNER SASH
6 x 8 x 16
8 x 8 x 16
10 x 8 x 16
12 x 8 x 16



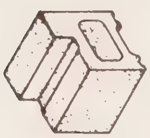
No. 3 HALF SASH
4 x 8 x 8
6 x 8 x 8
8 x 8 x 8
10 x 8 x 8
12 x 8 x 8

No. 4 'L' CORNER
6 x 8 x 16
10 x 8 x 16
12 x 8 x 16



No. 5 FLUSH PILASTER
8" Wall
10" Wall
12" Wall
For use with No. 6 and No. 7 joist blocks.

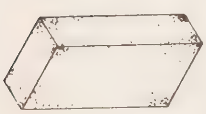
No. 6 FULL JOIST
8 x 8 x 16
10 x 8 x 16
12 x 8 x 16



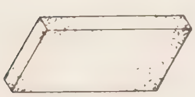
No. 7 HALF JOIST
8 x 8 x 8
10 x 8 x 8
12 x 8 x 8

No. 8 BRICK
2¼ x 4 x 8

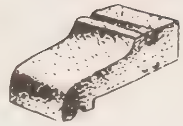
No. 9 JUMBO BRICK
4 x 4 x 8



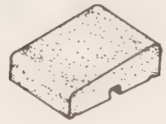
No. 10 4" SOLID
4 x 8 x 16



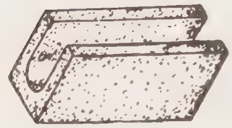
No. 11 2" SOLID
2 x 8 x 16



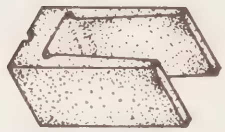
No. 12 WINDOW SILL
10 x 3⅝ x 8



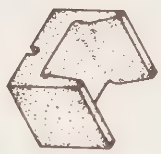
No. 13 COPING
10⅝ x 7⅝



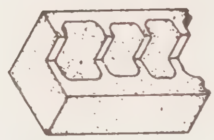
No. 14 BOND BEAM LINTEL
6 x 8 x 16
8 x 8 x 16
10 x 8 x 16
12 x 8 x 16



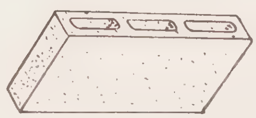
No. 15 FULL LINTEL
8 x 8 x 16
10 x 8 x 16
12 x 8 x 16



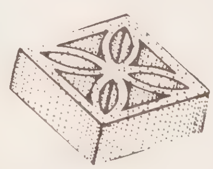
No. 16 HALF LINTEL
8 x 8 x 8
10 x 8 x 8
12 x 8 x 8



No. 17 HEADER
8 x 8 x 16



No. 18 PARTITION
4 x 12 x 24
6 x 12 x 24
8 x 12 x 24



No. 19 SUN SCREENS
Various Shapes

No. 20 HALF HIGH
4 x 4 x 16
6 x 4 x 16
8 x 4 x 16
10 x 4 x 16
12 x 4 x 16

Courtesy: National Concrete Block Co. Ltd., Edmonton.

EXHIBIT 10 (b)

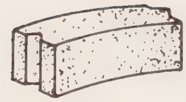
SIDEWALK BLOCKS
24" x 30" Steel reinforced.
Fully guaranteed.

RUBBER CONTROL JOINTS
No cutting or sawing.
No building paper or mortar required.

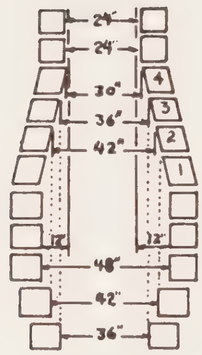
STEEL REINFORCING
Where added strength in mortar joints is desirable.

FLUE TILE LINING
Two foot lengths.
Generally recommended for all chimneys.

COLORED BLOCKS
Enquiries invited.
Large selection of colors.

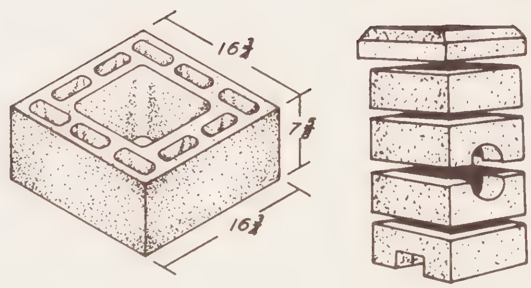


MANHOLE AND WELL LINERS



Manhole
24", 6 blks. per course
No. 4, 10 blks. per course
No. 3, 10 blks. per course
No. 2, 12 blks. per course
No. 1, 12 blks. per course
48" 10 blks. per course
42", 10 blks. per course
36", 8 blks. per course

24"	24"	30"	36"	42"	48"	42"	36"
1	2	3	4	16¾	7⅝	16¾	



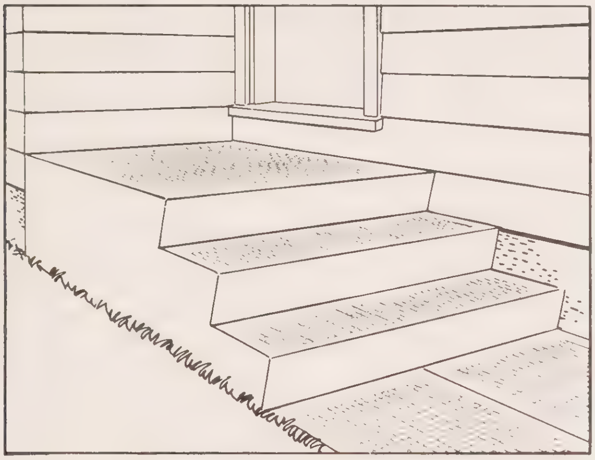
CHIMNEY BLOCK
Standard Chimney Block (9⅛" Flue). Chimney Blocks are available with: 3"-7" Thimble Openings and Cleanout Holes.

SIZES—Concrete blocks are always expressed wall width first, followed by the height of the block then the length. Actual dimensions of the block are ⅜" less than these figures. Example: Block indicated as 8" x 8" x 16" are actually 7⅝" x 7⅝" x 15⅝". The ⅜" difference is the allowance for the mortar joint. Where fractions are shown, these are the exact dimensions.

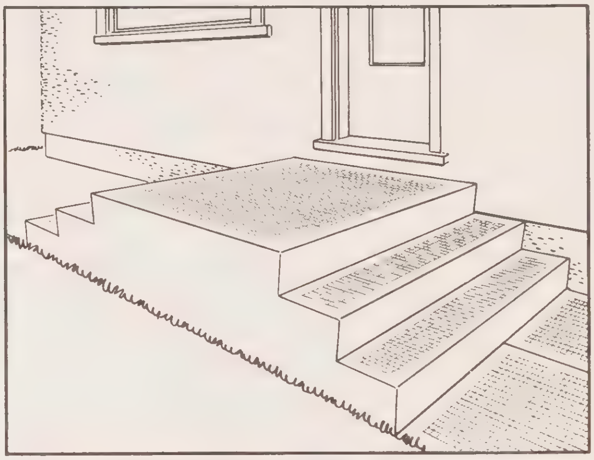
Courtesy: National Concrete Block Co. Ltd., Edmonton.

EXHIBIT 10 (c)

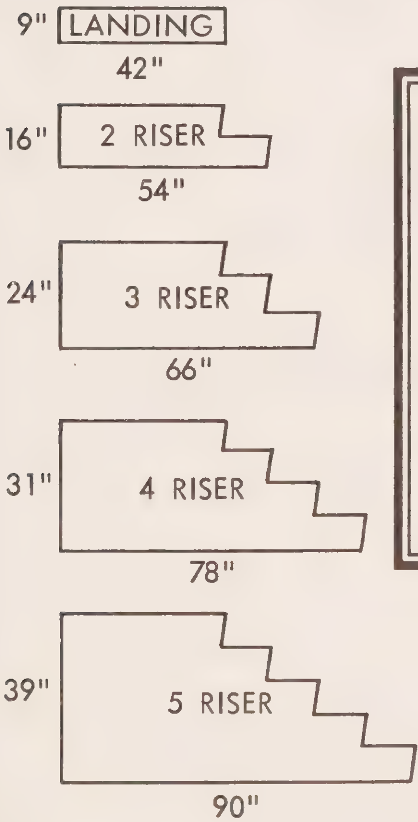
PRE-CAST CONCRETE STEPS AND SIDEWALK BLOCKS



THREE-RISER SIDE ENTRY



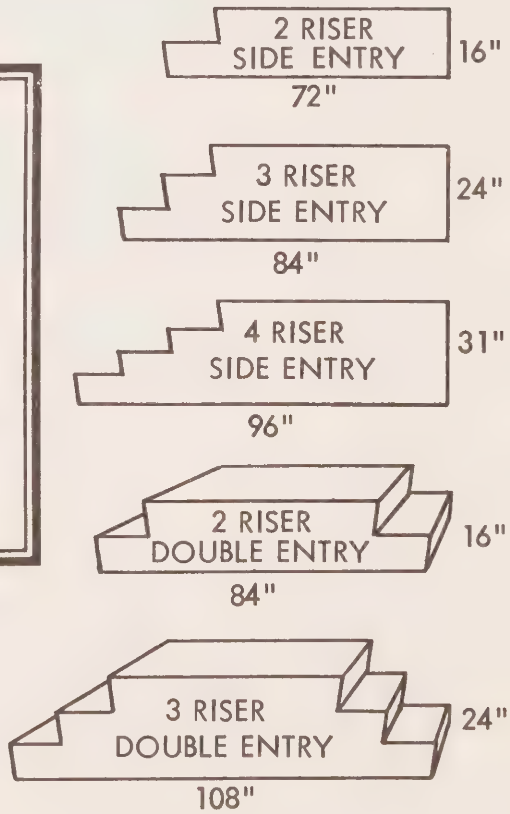
THREE-RISER DOUBLE ENTRY



1 to 5 RISERS IN 4', 5' OR 6' WIDTH

ALL LANDINGS 42" DEPTH

ALL DOUBLE ENTRIES AND SIDE ENTRIES IN 48" DEPTH



Courtesy: P. Kruger Concrete Products (Manitoba) Ltd.

In most cases, standard molds are available for most products. However, it may be necessary to handmake some molds to meet customer specifications. The estimated cost of molds during the initial phases of operation in the "other precast products" category is $4,000.

4.7 Operating Characteristics

4.7.1 General Characteristics

As most building activity north of the 60th parallel is limited to the summer months, it is expected that the requirement for concrete products (block, brick and other products) would in a sense have the same seasonal activity. Although concrete can be poured in low temperature climates, this requires protected and heated working areas and proves to be a very expensive method of construction. The long range historical temperature averages by month and the maximum and minimums for each month over the last twelve months (1973 to 1974) is shown for Hay River in Table 23.

Table 23

Average Normal Mean Temperatures (Historical) and Maximum and Minimum Temperatures for the Months July 1973 to June 1974, Hay River

Month	Historical Normal Mean Temperature	Maximum Temperature Month 1973/1974	Minimum Temperature Month 1973/1974
July	60	93	44
August	58	88	32
September	47	74	26
October	34	56	15
November	8	30	-20
December	-5	27	-37
January	-14	26	-50
February	-8	31	-44
March	5	20	-40
April	23	60	-21
May	41	67	8
June	53	82	35

Under these climatic conditions, it would normally be expected that construction activity could extend from early May to September or four to five months. As would appear to be the case, it would normally be expected that concrete block and brick production could extend from May to September (five months) which would provide sufficient "cure" time for those products produced in May for June construction.

During the off season, it would be possible for special product casting to be done, assuming the building is heated. In fact it may be expected that special products such as "curbing", patio slabs, sidewalk slabs, etc., which would be more labour intensive, would be produced to inventory in the winter for summer construction.

With a five month block/brick manufacturing season the output of the plant is estimated as follows:

* *Estimated Sales Volume*

Concrete block (8 inch equivalent)	250,000 units
Concrete brick (estimated at 20 to 1 for 8 inch equivalent)	7,000 units
Total Sales (8 inch equivalent)	257,000 units

* *Estimated Production Capacity*

8 inch equivalent @ 600 blocks per hour @ 6 hours per day	3,600/day
Days available (20 days x 5 months)	100 days
Total Capacity	360,000 units

* Estimated production days required @ sales volume noted — 72 days or 3.6 months, say four months.

4.7.2 Input Material - Volumes and Prices

Assuming an annual volume of 257,000 8 inch equivalent concrete block, the material requirements for block and brick are:

* Cement	465 tons
* ¼" Stone Aggregate	4,100 cubic yards
* Sand	8,060 cubic yards

NOTE: based on 1 cement to 10 sand and stone mix.

If we assume a 20% volume of the above figures for other precast concrete products, the quantity of input material could reach:

* Cement	614 tons
* ¼" Stone Aggregate	4,920 cubic yards
* Sand	9,670 cubic yards

NOTE: Normal concrete would take 1.6 times block requirements.

The estimated laid down costs for the above materials is as follows (July 1974 prices):

Cost of Input Material

	Yellowknife	Hay River
	$	$
Cement - 80 lb. Bag[1]	90.21/ton	73.94/ton
- 22 ton Bulk Truck[2]	84.30/ton	68.03/ton
¼" Crushed Stone Aggregate	4.75/cu.yd.	5.00/cu.yd.
Sand	3.50/cu.yd.	3.50/cu.yd.

[1]FOB price Edmonton bags - $40.17/ton
[2]FOB price Edmonton bulk - $34.26/ton

As there are existing sand and stone aggregate suppliers in both Yellowknife and Hay River, it is not anticipated that the concrete products plant would get into the sand and gravel business. In addition, because volumes are relatively small, the cost of equipment would be excessive for the size of operation.

Although the 22 ton bulk truck price of concrete is $5.91 per ton less than the 80 lb. bag price, the 80 lb. bag price will be used for price calculations. At the 257,000 eight inch equivalent block sales level (+20%) the difference is approximately $3,300.00 which would, on a yearly basis, probably cover the cost (depreciation, maintenance, operation) of a silo storage system. On a per block basis this amounts to approximately one cent per block which should be taken advantage of once higher production levels are achieved.

4.7.3 Staffing

4.7.3.1 *Hourly Staffing*

The staffing required for plant operation reflects the low labour ratio prevalent in the industry. It is estimated that the staff required would be as follows:

Position	No. Req'd	Hourly Rate	Description of Duties
		$	
Molder	1	6.00	Operates molding machine, off-loads block into racks. Also able to perform minimum mold maintenance and general machinery maintenance.
Mixer	1	5.50	Operates front end loader, charges mixer, loads trucks with boom attachment, able to perform minor machine maintenance.
Kiln Man	1	5.00	Moves loaded racks into kiln, operates kiln (under supervision), unloads kilns, cubes (stacks) block. Performs general utility work in plant and yard; assists in loading trucks, kilns and molding operation, performs janitorial duties.
Total Manning	3		

The above staff would work during the block making season (summer). In the "off" months only the Molder and the Mixer would normally be retained to do equipment maintenance, mold repair, both under direction, as well as prepare molds and materials for the "hand" casting of other special products for summer inventory. As such these two individuals should have some carpentry and basic form preparation skills.

4.7.3.2 *Managerial and Office Staff*

The prime need of this type of low volume block making operation is an Owner/Manager, fully experienced in concrete operations who also acts as a Marketing and Sales Manager to promote the Company's products.

The Owner/Manager would also be a highly skilled operations man who has direct operating and maintenance capability in the operating characteristics of the plant and equipment. It would be this man's responsibility to operate the plant efficiently, maintain all plant and equipment, plan production schedules, manage inventory and transportation logistics.

Supporting the senior man would be a part-time Clerk/Typist/Bookkeeper. The duties of this individual would be to perform all clerical and typing functions as well as keeping the financial accounts.

In summary, the managerial and office staff would cost as follows:

	Annual Salary
	$
* President	20,000
* Clerical/Typist/Bookkeeper (part-time)	5,000
	25,000

4.7.3.3 *Staffing Summary*

The expected cost of staff at the 260,000 block (8 inch equivalent) level, plus 20% for other precast concrete products, would be as follows:

Managerial	Cost
	$
* Full-time President	20,000
* Part-time Clerk/Typist/Bookkeeper	5,000
	25,000

Plant			Cost
			$
* Full-time	Molder @ $6.00/hr[1]		12,000
	Mixer @ $5.50/hr[1]		11,000
* Part-time	Kiln Man @ $5.00/hr[2]		3,340
			26,340
Total Managerial and Plant			51,340

[1]Based on 2,000 hours per year
[2]Based on 4 months @ 167 hours/month

4.7.3.4 *Availability of Labour*

Manpower requirements are minimal in terms of numbers. However, there is a requirement for a high degree of mechanical and, to a lesser extent, carpentry skills. It is not expected, however, that any great difficulty would be experienced in attracting plant staff should the plant be located in the more populated areas. The major problem area will be in attracting the Owner/Manager, who must have a relatively high degree of knowledge in concrete products operation. This will be more fully explained under section 4.8 "Ownership".

4.7.4 Operating Costs

A breakdown of basic operating costs are outlined in Table 24. In addition to the total shown in Table 24, a figure of $1,000 is estimated for the cost of reinforcing bar for "other products".

Employee Fringe Benefits: the cost of various fringe benefits, i.e. insurance, compensation, health, etc., is estimated at 9% of total payroll.

Light, Heat, Power, Water, Sewage and Telephone: this is difficult to establish. However, the national average is one dollar for every 15 dollars expended in raw materials. In order to reflect the higher costs of these services, a 1 to 12 ratio was used.

Operating Supplies: these should be minimal and consist of maintenance and basic operating supplies.

Office Supplies: again minimal and need no further explanation.

Sales Expense: some travel will be required and a minimal amount of price lists should be developed.

Accounting and Legal: no major expense should be anticipated and the figures represent this belief.

Insurance: this is difficult to assess. Minimum coverage would be required.

Table 24

Estimated Operating Costs for 257,000 Block Plant (plus 20%)

Variable and Fixed Overhead Costs	$
Employees Fringe Benefits	4,600
Light, Heat, Power, Water, Sewage, Telephone	8,500
Operating Supplies (includes labour)	500
Office Supplies	300
Sales Expense - Travel	1,000
- Literature	400
Accounting and Legal	2,000
Insurance	2,000
Total Variable and Fixed Overhead	19,300
Salaries and Wages	
Managerial and Plant	51,340
Direct Material Cost[1] (assume Hay River prices)	
Cement (626 tons)	46,290
¼" Aggregate (5,010 cubic yards)	25,050
Sand (9,860 cubic yards)	34,510
Total Material Cost	105,850

[1]Includes 2% for waste

4.7.5 Capital Expenditures

The following capital expenditures would be required:

	$
* land - fully serviced and stored	25,000
* building - complete	74,400
* equipment - block and brick machinery	49,000
- other products	2,600
* molds - block and brick	25,000
- other products	4,000
Total Capital Expenditures	180,000

4.7.6 Basic Product Pricing

In an earlier section of this report, the laid down cost of 28 pound light-weight aggregate block was identified. In order to become competitive and to make concrete products a more economic, and thus, more appealing building product, a significant price advantage should be achieved if the market potential is to be realized. The laid down price of the imported block is shown in Table 25 (ex. Grand Prairie). Also shown in the Table is the recommended probable prices of the N.W.T. block at each location to ensure a receptive market for the product line. Only concrete block is used for illustration as it is assumed that other products, i.e. brick, curbs, etc., show the same relationship.

Table 25

Laid Down Price of Block by Destination and Suggested N.W.T. Produced Price

Market	Laid Down Price ex Grand Prairie	Optimum N.W.T. Laid Down Price
	(¢ Per Block)	(¢ Per Block)
Hay River	93.80	70.00
Yellowknife	119.56	90.00
Rae/Edzo	119.56	90.00
Fort Providence	99.68	75.00
Fort Simpson	119.56	90.00
Jean Marie River	n.a.	n.a.
Enterprise	93.80	70.00
Pine Point	99.68	75.00
Fort Resolution	108.08	80.00
Fort Smith	108.08	80.00

In the preceding part of this section it was seen that the cost of materials is a major expense as far as operating costs are concerned. Using a simple proportion approach to product line costing (excluding capital charges) we can develop the following relationship of costs as shown in Table 26.

If we were to assume that capital charges for the full plant expenditure of $180,000 was at a rate of 10%, interest expenses would be $18,000 per year.

If it were then assumed that the FOB selling price of products was:

* concrete block	$0.65 per block
* brick	$0.05 per brick
* other products	$15.00 per ton

...the preliminary operating position would be approximately as follows:

	$
Revenue	
250,000 concrete block @ 65¢	162,500
140,000 concrete brick @ 5¢	7,000
3,995 tons other products @ $15/ton	59,925
Total Revenue	229,425
Operating Expenses	
materials	106,850
operations - overhead	19,300
- salaries and wages	51,340
depreciation	17,390
interest	18,000
Total Operating Expenses	212,880
Indicated Profit (before taxes)	16,545

On this basis the preliminary estimates of selling prices (FOB plant) would appear realistic as a starting point for further analysis.

4.7.7 Plant Location

There are three probable locations under consideration for the site of the plant: Yellowknife; Hay

Table 26

MANUFACTURING COST OF PRODUCT - LESS DEPRECIATION (BASED ON HAY RIVER PRICES)

	Concrete Block	Concrete Brick	Other Products	Total
Tons of Cement Used	462	13	151	626
Cost of Cement	$ 34,160	$ 965	$ 11,165	$ 46,290
% use of Sand & Aggregate	81%	2%	17%	100%
Cost of Sand & Aggregate	$ 48,244	$ 1,191	$ 10,125	$ 59,560
Cost of Rebar	-	-	1,000	1,000
Total Material Cost	$ 82,404	$ 2,156	$ 22,290	$106,850
Percent Material Cost	77%	2%	21%	100%
Cost of Operations				
Overhead	$ 14,861	$ 386	$ 4,053	$ 19,300
Salaries & Wages	39,532	1,027	10,781	51,340
Total Cost Operations	$ 54,393	$ 1,413	$ 14,834	$ 70,640
Total Operating Cost of Production	$136,797	$ 3,569	$ 37,124	$177,490
Units Made	250,000 block	140,000 brick	3,995 tons	
Cost Per Unit	54.72¢/unit	2.55¢/unit	$9.34/ton	

Depreciation of land building and equipment must then be apportioned to each product line. The normal depreciation schedule would probably be on the following basis.

Item	Value	Rate of Depreciation	Annual Cost $
Land	$ 25,000	5%	$ 1,250
Building	74,400	5%	3,720
Equipment -Block/Brick	49,000	10%	4,900
-Other Prod.	2,600	20%	520
Molds - Block/Brick	25,000	20%	5,000
- Other Prod.	4,000	50%	2,000
		Annual Depreciation	$17,390

River and Fort Simpson. The prime factors for assessing plant location in this instance are:

* the pricing of the product in each market as compared to imported product; and
* the cost of raw materials at the plant site.

The availability of serviced land would not appear to be a major consideration as, should the project proceed, it is probable that serviced land could be made available. In addition, labour would not be a major consideration as the number of individuals required is relatively small.

The major material cost which affects price is that of cement. The landed cost of cement bags in Yellowknife would be $90.21/ton; Fort Simpson $87.17/ton; and Hay River $73.94/ton. A $15/ton differential would add approximately $9,300 to operating expenses, which at the indicated level of production is excessive. Both Yellowknife and Fort Simpson would suffer in this respect as possible plant sites.

In addition, freight costs for shipping the finished product is costly in relation to the manufacturing cost of the product. A comparison of N.W.T. block laid down price by locality, the competitive imported light-weight block price, and the optimum suggested price by destination are shown in Table 27, with Grand Prairie FOB plant price 42¢ and Hay River at 65¢.

It is evident that although the competitive advantage is available to the N.W.T. block, the advantage for the Hay River location far exceeds that for other localities in the market area.

In summary, when considering Yellowknife and Fort Simpson as plant sites, the backhaul freight cost to southern and southeast locations (estimated Yellowknife to Hay River at 23.2¢ per block) would effectively eliminate any price advantage over light-weight block that a Hay River location would have. Added to this is the increased cost of cement at the Yellowknife or Fort Simpson locations.

However, it should be pointed out that the cost disadvantage associated with a Yellowknife and Fort Simpson lcoation (or for that matter places like Rae/Edzo) could be equalized by such government initiatives

as financing the whole project via a grant as opposed to a combination of a grant/soft loan or see it stand on its own two feet supported by funds at competitive rates.

The study shows the relative advantages and disadvantages at the different locations and the optimum site under the same assumptions. It is up to the policy makers to use this information as a basis for sound decision making. Needless to say, every effort should be made to spread the economic benefits among as many of the communities as possible.

Table 27

Comparison of Laid Down Block Prices in Cents
(based on 40,000 lb. loads-truck)

Destination	ex Grand Prairie Light-Weight	ex Hay River Plant N.W.T. Heavy-Weight	Suggested Optimum
	¢	¢	¢
Hay River	93.80	65.00	70.00
Yellowknife	119.56	111.40	90.00
Rae/Edzo	119.56	104.60	90.00
Fort Providence	99.68	95.40	75.00
Fort Simpson	119.56	107.40	90.00
Jean Marie River	n.a.	n.a.	n.a.
Enterprise	93.80	70.00[1]	70.00
Pine Point	99.68	88.20	75.00
Fort Resolution	108.08	101.40	80.00
Fort Smith	108.08	99.00	80.00

[1]Freight to Enterprise estimated at 5¢ per block

4.8 Corporate Ownership

The Government of the Northwest Territories has stated that it wishes to encourage private entrepreneurship within the Territories. It recognizes that little investment capital exists in private hands, and that the size of the markets available make outside interests hesitant to enter on a financial or operating basis.

The amount of capital required for the proposed

plant is not excessive (direct capital expenditures of $180,000 to $200,000) and several ways could be explored in financing such a venture. There are, however, certain key needs for a business such as outlined in this report, namely:

* good management is essential, since little staff is required, and the success of the operation depends on the ability of the Owner/Manager in technical, sales, and management areas;
* the principals involved must have a financial interest to provide the incentive to make the operation a success;
* opportunity to the native people should be provided, either in jobs or as an investment. As investors, there would be a greater interest in developing a successful operation;
* it would be necessary for all Governments to support the undertaking in terms of specifying N.W.T. concrete block wherever design considerations and costs of construction permit. This would establish a strong operating base for the new enterprise.

4.8.1 Investment Participation

As the key to success depends on the Owner/Manager, such an individual could possibly be attracted from the local business community particularly in the areas of:

* Construction;
* Redi-Mix Concrete;
* Sand and Gravel.

As most of the local entrepreneurs in these three areas have been or are in concrete business in some way, it may be attractive to them in that such an operation could be incorporated within their existing management structure.

Another source of funds could be from the Indian Economic Development Fund on behalf of the Hay River, the Fort Simpson or Rae/Edzo Band if it were decided to locate the plant in one of the locations. In this instance the ownership of the business would eventually be transferred to the Band.

4.8.1.1 *Owner/Manager*

Should a local entrepreneur become interested in the project he would have to have the ability to raise and/or guarantee the following amounts:

* Capital Cost	$180,000
* Working Capital Loan	50,000
* Start-up Costs	16,000

With the cost of money currently at 12% the carrying charge of about $30,000 would make the venture of marginal interest with returns to the Owner basically limited to a salary of $20,000 per annum (refer to section 4.7.6). The Owner/Manager would have to look to the growth of the business and eventual capital gain as his ultimate reward. The rate of return on his capital, however, at about 10%, would have a restraining influence on the entry of potential entrepreneurs.

4.8.1.2 *Investor/Manager*

In this case the Investor/Manager would contribute $30,000 for the 49% ownership of the enterprise. The Department of Indian and Northern Affairs, on behalf of the Hay River Band or any other Band, would contribute the balance via the Indian Economic Development Fund. At the end of a suitable length of time, say ten years, the Investor/Manager could be bought out as per some agreed upon formula with the Band receiving full control and ownership of the operation. The financing could come via the following formula:

* Investor/Manager (49%)	$ 30,000
* Band Ownership (51% via grant loan from IEDF)	30,000
* Loan from IEDF @ 9% over ten years	136,000
* Working Capital (line of credit at the bank jointly guaranteed by Investor and Government	50,000

4.8.2 Corporate Organization

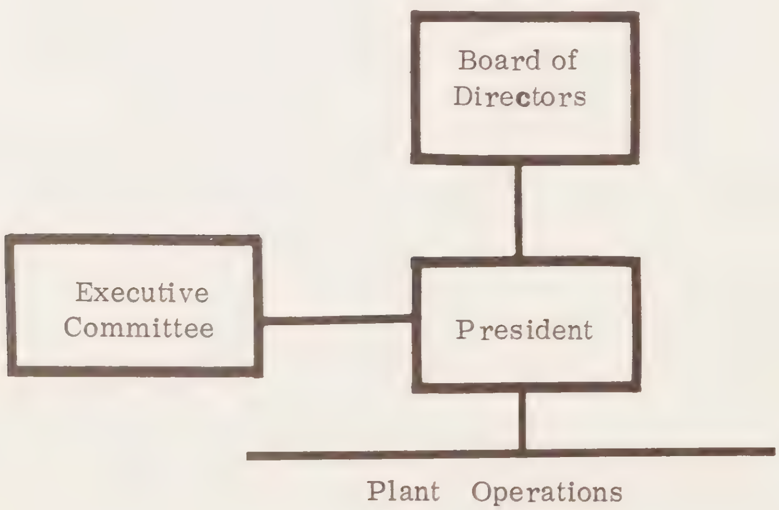
Should a local Owner/Manager situation develop, the corporate organization would rest with the principal.

The investor/manager -- corporate organization would require the appointment to the Board of individual from the investor/manager, one from Indian Affairs, a member of the (Hay River) Band and one member from the Government of the Northwest Territories.

The basic responsibilities of the Board would be to ensure the compliance of the investor/manager with the terms of his management contract and to ensure that the Band will eventually assume corporate control; also to provide policy direction and control to the investor/manager.

The investor/manager would assume the responsibilities of the President/General Manager. As is it essential to provide exposure to the company's operations to a responsible member of the Band, it is suggested that the chosen member of the Board from the Band and the representative from DIANA, along with the President, form an Executive Committee. The Executive Committee would meet every month to review operations and progress. As the company grows and as the experience of the representative of the (Hay River) Band matures, there would probably be a need for this individual to assume a more direct role within the operations of the Company, probably at a Plant Superintendent level.

The Corporate structure would appear as shown below for the investor/manager project.



4.9 Financial Feasibility

The capital requirements of the concrete products plant would be as follows:

* Capital Purchase (Land and Equipment)	$180,000
* Working Capital and Start-up Costs	66,000
Total	$246,000

4.9.1 Capital Purchases

Practically all equipment to be used in the plant should be purchased used. The cost of new euipment would be prohibitive at the low level of sales volume predicted.

4.9.2 Start-up Costs

Start-up costs are associated with extra expenses which would be needed for providing changes to installation, extra installation costs, breakdown expense and other expenses related to the start-up of the operation. It is suggested that the President (if not fully qualified), the Molder and the Mixer, attend a concrete machinery supplier's school to become familiar with the operating and mechanical aspects of the equipment and to become familiarized with concrete technology. The costs of this training can be expensed.

4.9.3 Working Capital

It is essential that sufficient funds be available to purchase supplies, materials, pay staff, utilities, etc. until such time as product can be shipped and monies for same received and to provide sufficient capital to cover early expected losses and cost of inventory.

All figures used in the report are in constant 1974 dollars. It must be realized that material prices will probably accelerate at a 3% to 5% rate per year and labour at a 7% to 10% per year assuming no recessional activity and a continuation of present inflationary pressures.

4.9.4 Pro Forma Financial Statements

The following pro forma operating statements illustrate the possible profit and loss position of the company over the first five years of operation. It is assumed that the plant would be in operation by the summer of 1976 and that the population projections of the pipeline construction would become a reality. Table 28 shows the forecasted sales volumes and revenues for 1976 through to 1989.

Table 28

Forecasted Annual Revenue 1976 to 1980

	1976	1977	1978	1979	1980
Market Population	21,500	22,800	24,200	25,500	26,900
Sales					
Blocks					
- units	129,000	171,000	217,000	229,500	245,000
- $ @ 65¢ each	$ 83,850	$111,150	$141,570	$149,175	$159,250
Brick					
- units	75,000	102,600	121,000	127,000	135,000
- $ @ 5¢ each	$ 3,750	$ 5,130	$ 6,050	$ 6,375	$ 6,750
Other					
- tons	500	1,400	3,000	3,500	4,000
- $ @ $15/ton	$ 7,500	$ 22,500	$ 45,000	$ 52,500	$ 60,000
Total Sales	$ 95,100	$138,780	$192,620	$208,050	$226,000

It should also be noted that staffing levels would, during the early years, consist of the President and the Molder with the Mixer added in the third year. The fourth year would see the part-time man added to staff. The Clerk/Typist would be part-time and utilization would be relative to sales volume.

The pro forma financial statements are shown in the following Tables:

Table 29 - Operating Statement
Table 30 - Depreciation Schedule
Table 31 - Summarized Balance Sheets
- Statement of Retained Earnings
Table 32 - Changes in Assets, Liabilities and Ownership Equity
- (Source and Application of Funds - 1976-1980)

Table 29

PRO FORMA OPERATING STATEMENT
1976 - 1980

	1976	1977	1978	1979	1980
Revenue	$ 95,100	$138,780	$192,620	$208,050	$226,000
Operating Costs					
Materials	$ 44,290	$ 64,634	$ 89,709	$ 96,895	$105,255
Salaries & Wages	34,000	35,000	47,200	50,840	51,340
Overhead (operating)	7,051	8,936	12,122	13,150	13,891
Sales & Administration	4,200	4,100	4,900	5,100	5,700
Depreciation	17,390	15,548	13,987	12,659	11,524
Interest	18,240	17,016	15,792	14,568	13,344
Start-up Costs	16,000	-	-	-	-
Total	$141,171	$145,234	$183,710	$193,202	201,054
Net Profit(Loss) before Tax	($46,071)	$(6,454)	$ 8,910	$ 14,747	$ 24,946
Taxes	-	-	-[1]	-[1]	-[1]
Net Profit (Loss)	($46,071)	$(6,454)	$ 8,910	$ 14,747	$ 24,946
Year End Inventory	$ 8,000	$ 12,000	$ 18,000	$ 19,000	$ 21,000

[1] Assume no tax Liability due to previous losses

Table 30

DEPRECIATION SCHEDULE
1976 - 1980

	1976	1977	1978	1979	1980
Plant & Land					
Opening	$ 99,400	$ 94,430	$ 89,708	$ 85,223	$ 80,962
Depreciation 5%	4,970	4,727	4,485	4,261	4,048
Closing	$ 94,430	$ 89,708	$ 85,223	$ 80,962	$ 76,914
Equipment					
Block & Brick					
Opening	$ 49,000	$ 44,100	$ 39,690	$ 35,721	$ 32,149
Depreciation 10%	4,900	4,410	3,969	3,572	3,215
Closing	$ 44,100	$ 39,690	$ 35,721	$ 32,149	$ 28,934
Other Products					
Opening	$ 2,600	$ 2,080	$ 1,664	$ 1,331	$ 1,065
Depreciation 20%	520	416	333	266	213
Closing	$ 2,080	$ 1,664	$ 1,331	$ 1,065	$ 852
Molds					
Block & Brick					
Opening	$ 25,000	$ 20,000	$ 16,000	$ 12,800	$ 10,240
Depreciation 20%	5,000	4,000	3,200	2,560	2,048
Closing	$ 20,000	$ 16,000	$ 12,800	$ 10,240	$ 8,192
Other Products					
Opening	$ 4,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Additions	-	2,000	2,000	2,000	2,000
Depreciation 50%	2,000	2,000	2,000	2,000	2,000
Closing	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Total Depreciation	$ 17,390	$ 15,548	$ 13,987	$ 12,659	$ 11,524
Asset Value Year End	$162,610	$149,062	$137,075	$126,416	$116,892

Table 31

PRO FORMA SUMMARIZED BALANCE SHEET
1976 - 1980

	Start of 1976	1976	1977	1978	1979	1980
Assets						
Property & Equipment	$180,000	$162,610	$149,062	$137,075	$126,416	$116,892
Inventory	-	8,000	12,000	18,000	19,000	21,000
Cash	66,000	29,319	18,813	20,110	30,916	49,336
	$246,000	$199,929	$179,875	$175,185	$176,332	$187,228
Liabilities						
Equity	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000	$ 60,000
Bank Loan	50,000	50,000	50,000	50,000	50,000	50,000
I. E.D. F. Loan	136,000	136,000	122,400	108,800	95,200	81,600
Retained Earnings	-	(46,071)	(52,525)	(43,615)	(28,868)	(4,372)
	$246,000	$199,929	$179,875	$175,185	$176,332	$187,228

PRO FORMA STATEMENT OF RETAINED EARNINGS

	Start of 1976	1976	1977	1978	1979	1980
Balance of Start of Year	$ -	$ -	$(46,071)	$(52,525)	$(43,615)	$(28,868)
Income(Loss) for Year	-	(46,071)	(6,454)	8,910	14,747	24,496
Balance Carried Forward	$ -	$(46,071)	$(52,525)	$(43,615)	$(28,868)	$ (4,372)

Table 32

CHANGES IN ASSETS, LIABILITIES & OWNERSHIP EQUITY

(Source and Application of Funds - 1976-1980)

	1976	1977	1978	1979	1980
Source					
I.E.D.F. Loan	$136,000	$ -	$ -	$ -	$ -
Bank Loan	50,000	-	-	-	-
Equity	60,000	-	-	-	-
	$246,000				
Reduction in Cash	$ -	$ 10,506	$ -	$ -	$ -
Depreciation	17,390	15,545	13,987	12,659	11,524
Profit on Years Operations	-	-	8,910	14,747	24,491
	$263,390	$ 26,054	$ 22,897	$ 27,406	$ 36,020
Application					
Plant and Equipment	$180,000	$ 2,000	$ 2,000	$ 2,000	$ 2,000
Inventory	8,000	4,000	6,000	1,000	2,000
Reduction of I.E.D.F. Loan	-	13,600	13,600	13,600	13,600
Cash in Bank	29,319	-	-	-	-
Loss on Years Operations	46,071	6,454	-	-	-
Increase in Cash	-	-	1,297	10,806	18,420
	$263,390	$ 26,054	$ 22,897	$ 27,406	$ 36,020

As shown in Table 29 the concrete products plant swings from a loss to a modest profit level in the third year (1978) of operation and improves its financial performance in each of the subsequent years. We have assumed that the Company will not be liable for corporate income taxes in the first five years of operations because of the losses suffered in 1976 and again in 1977. Income in subsequent years, even after taxes, should be in the $20,000 per annum category and as such, should provide an attractive level of dividends to both the Investor/Manager and the Band.

Table 31 highlights the Balance Sheet items in the 1976-1980 period. In the five years of operations the cash position first plunges from the $66,000 level to a low of $18,000 (1977) and then, with improved profitability, climbs to the $49,000 level by 1980. Retained earnings, because of the first two years of losses, turn negative plunging to a low of $52,000 by 1977 and then return to a positive position by 1981.

4.10 Implementation

Although the project has no direct relationship with the proposed activity along the Mackenzie Corridor, the probable effect of the gas pipeline, especially with respect to the market area population, will expand minimally the market for concrete products. Should the project be undertaken, a concerted effort must be made to "sell" all product lines, particularly those classified as "other products", i.e. precast steps, curbs, patio stones, etc. It would be necessary to provide some off-season work for the plant and it is in this area that such work could be generated.

In order to meet the proposed starting date of the 1976 season the following generalized approach to implementation should be taken.

(a) After thorough review of the feasibility study, a commitment be made by both the Governments of Northwest Territories and the Department of Indian and Northern Affairs.

(b) The Department of Indian and Northern Affairs assume the responsibility of financing the project at attractive rates via the Indian Economic Development Fund.

(c) Investors be approached from the following sources:

* Owner/Manager;
* Investor/Manager;
* Hay River Band or suitable alternative.

(d) Selection of the investment group.

(e) Incorporate the Company.

(f) Appoint the Board of Directors.

The above steps should be completed by the end of 1974.

Between January 1975 and April 1975, the following should be accomplished:

(a) Selection of plant site.

(b) Design of building.

(c) Select product line items.

(d) Design process machinery layout for all equipment required.

(e) Issue quotation tenders for building and equipment and site preparation.

From May 1975 October 1975, the following should be done:

(a) Select building contractors and equipment suppliers and award contracts.

(b) Prepare site and erect building.

(c) Install equipment.

(d) Equipment suppliers dry-run operation.

(e) Contracts let for the supply of raw materials, with initial delivery March-April, 1976.

(f) Interview and select key staff.

NOTE: Interim construction financing would be required. However, no provision has been made in the financial analysis for this expense.

Between November 1975 and April 1976, the following steps should be taken:

(a) Arrange all financing;

(b) Train key staff;
(c) Supply contracts for product(s) obtained;
(d) Start production.

Official opening of the plant would be scheduled for June 1976.

It is expected that accounting and control systems would be simple. The part-time Bookkeeper, in view of the plant volume, should have no trouble in maintaining a simple set of accounts. Similarly the Investor/Manager would be able to handle inventory control, purchasing, production scheduling in addition to his role as the Marketing Manager and Chief Executive of the firm.

4.11 Product Alternatives

There are three basic types of precast building products.

* Light weight concrete block
  - using special light weight aggregates.
* Heavy weight concrete block
  - using sand and $\frac{1}{4}$" gravel aggregate.
* Wood fibre-cement block.

Light weight and heavy weight blocks were discussed in the body of the report and the feasibility study was centered on the manufacture of the heavy weight concrete block.

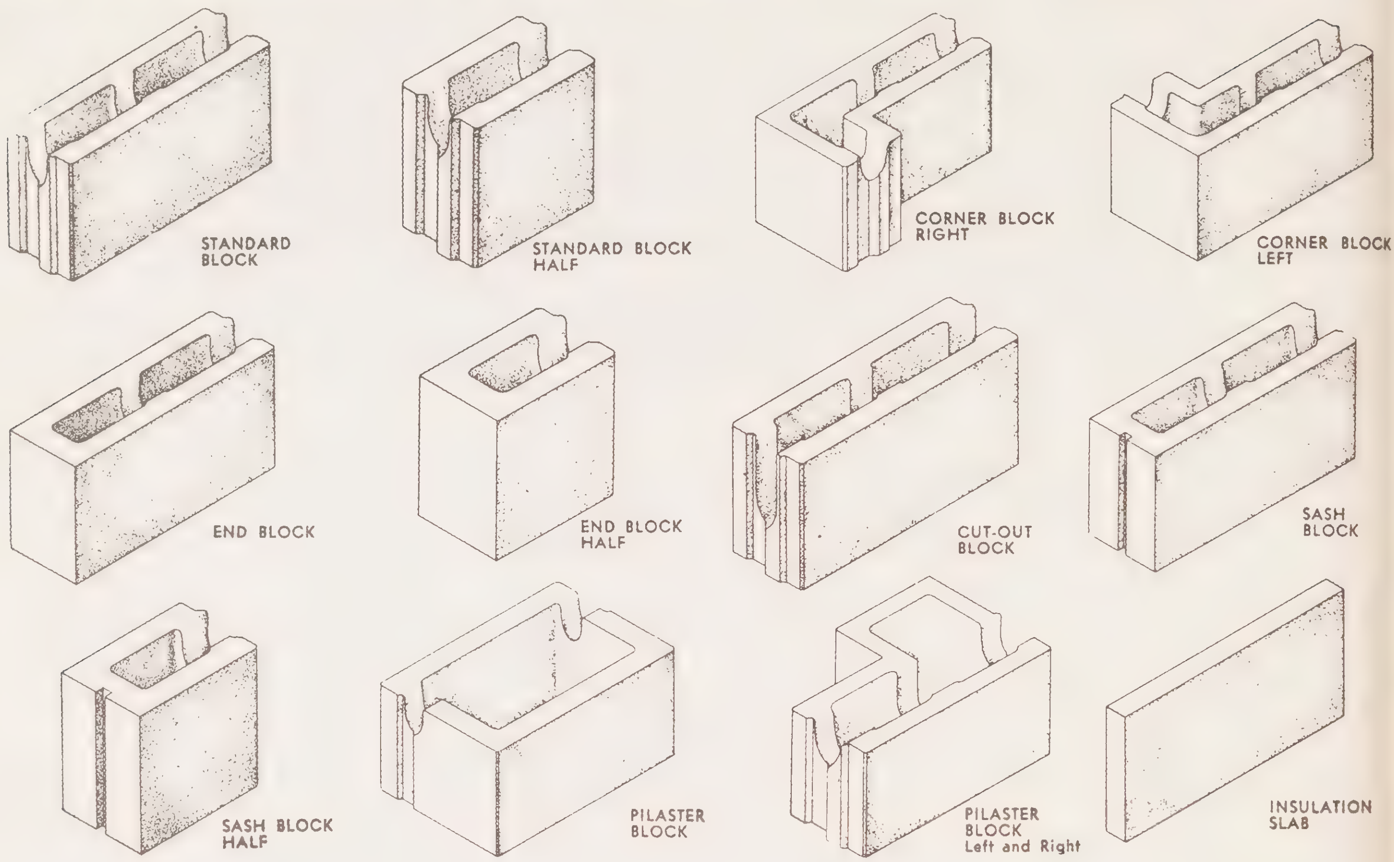
An alternative to this type of block is the wood fibre-cement block. This block requires a different type of construction method than the mortar joint concrete block. The wood fibre construction requires the placing of reinforcing steel both horizontally and vertically and the pouring of concrete into the cavities of the block. The product also requires a surface finish on exposed walls to minimize the uneven surface finish of the laid block. The block does, however, have excellent sound deadening qualities and good structural strength. The difference between the concrete and wood fibre block is not really significant.

The basic difference in choice, however, is cost. An eight inch standard concrete block (Edmonton

EXHIBIT 11

WOOD FIBRE - CEMENT BUILDING BLOCKS

FORM TYPES AVAILABLE IN 6", 8", 10" AND 12" WALL THICKNESSES.



VOLUME OF CONCRETE INFILL

Concrete required per 1,000 sq. ft. of Du-Al wall:

6" Du-Al Wall	7 cubic yards
8" Du-Al Wall	9 cubic yards
10" Du-Al Wall	14½ cubic yards
12" Du-Al Wall	18½ cubic yards

16" x 8" x 16" pilaster requires 9/10 cubic ft. per lineal ft. of pilaster.

16" x 12" x 24" pilaster requires 1 2/5 cubic ft. per lineal ft. of pilaster.

16" x 12" x 24" L-shaped pilaster requires ¾ cubic ft. per lineal ft. of pilaster.

For reinforced lintels and pilasters in Du-Al wall construction 2,500 or 3,000 pounds per square inch concrete is required.

SUGGESTED CONCRETE MIXTURES

Concrete 3,000 lb./per sq. in.—28 days			Concrete 2,000 lb./per sq. in.—28 days		
Cement by Volume	Sand by Volume	Gravel by Volume	Cement by Volume	Sand by Volume	Gravel by Volume
1	2	2½	1	4	4

NOTE—The strength may vary considerably upon qualities of the aggregate and water-cement ratio.

IMPORTANT—It is advised to use the highest allowed sand mixture when mixing concrete in order to increase the plasticity (50% rock, 50% sand). For 6" Du-Al Block wall it is necessary to use ½" screened or crushed rock aggregate. For the 8", 10" and 12" Du-Al Block wall the use of ¾" rock aggregate is advised.

STEEL DATA

BAR No.	NOMINAL DIMENSIONS DIAMETER Inch	NET AREA Sq. Inch	WEIGHT Per Lft.
—	¼	0.05	0.170
3	⅜	0.11	0.376
4	½	0.20	0.668
5	⅝	0.31	1.043
6	¾	0.44	1.502
7	⅞	0.60	2.044
8	1	0.79	2.670

prices) of approximately 0.877 square feet sells for 40¢ or 45¢ per square foot of surface wall area. The comparable wood fibre block sells for $1.48 for approximately two square feet or 74¢ per square foot.

The prime reason for the higher cost is the larger quantity of cement required for block construction. With the extremely high cost of cement delivered to the N.W.T., it does not appear likely that a competitive situation could be developed, even with a relatively cheap source of wood chips.

It is also understood that the individual who owns the patent rights would exact a royalty fee (probably between 1¢ and 4¢ per block depending on market conditions). In addition, the existing manufacturing facility in Edmonton has excess capacity and is not interested in establishing another manufacturing facility in Western and/or Northern Canada.

In consideration of the above, it was decided to evaluate the concrete block opportunity rather than the wood fibre block.

Exhibit 11 shows the typical products now available in the wood fibre-cement block category.

STUDY 3

THE FEASIBILITY OF ESTABLISHING SERVICE FACILITIES ON THE MACKENZIE HIGHWAY

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1. INTRODUCTION

In 1971, it was announced that the Mackenzie Highway would be extended past Fort Simpson to Inuvik, a distance of almost 700 miles. With the eventual completion to Tuktoyaktuk this highway would provide an all-weather road system from Southern Canada to the Arctic Coast. The highway which was initially scheduled for completion about 1980 at a total cost of over $100 million dollars, will provide road service for the first time to a number of isolated communities which have been served primarily by water and air transportation systems, and on occasions by winter roads made from packed snow or ice.

This report examines the opportunity for establishing facilities to provide the essential services, food, fuel and accommodation, that will be required by travellers along the new highway. We are pleased to present this report entitled "The Feasibility of Establishing Service Facilities on the Mackenzie Highway", for your consideration in partial fulfillment of the "Mackenzie Valley Pipeline and Highway Entrepreneurial Study".

2. SUMMARY

2.1 Background

The tourist and travel industry in the Northwest Territories has been growing rapidly over the past ten years and most experts agree that this growth will continue over the intermediate future. Section 3 looks generally at the travel industry in the N.W.T. and discusses the Mackenzie and other new Highways and their probable effects on tourism.

2.2 Demand for Services

Section 4 takes estimates from a number of different studies and puts together a projection of the various types of tourists and travellers expected in the Mackenzie Valley region in 1980.

Using the traffic projections shown in Table 1, the demand for each of the major services was calculated.

Table 1

Mackenzie Valley Travellers - 1980 Projections

	Low	Mean	High
Highway Tourists (persons)	9,300	14,000	24,700
Trucks (trucks)	1,500	4,400	9,700
Air and Water Tourists (persons)	4,500	6,400	8,250
Residents (thousand vehicle miles)	2,100	2,620	3,280
Business and Government (persons)	3,100	6,200	9,300

Table 2

Projected Demand for Services (1980)

	Low	Mean	High
Hotel/Motel (bed-nights)	35,000	50,000	75,000
Gasoline (gallons)	500,000	700,000	1,100,000
Diesel Fuel (gallons)	300,000	950,000	2,400,000
Restaurant (meals)	130,000	200,000	300,000

2.3 Location and Share of Market

Section 5 examines the possible locations for service units and recommends a motel, restaurant and service station at Wrigley, Fort Norman and Fort Good Hope. In addition to the facilities already available at Fort Simpson, Norman Wells and Inuvik, the average distance between essential services would be about 130 miles and the longest distance without services would be about 205 miles.

The share of market for each of these units was then calculated for each of the services.

2.4 Facilities Required

Section 6 examines the peak demand expected at each location during the month of July and estimates the physical facilities required.

Table 3

Distribution of Motel Use and Gasoline Sales

	Motel and Restaurant %	Gasoline and Diesel Fuel %
Wrigley	22	29
Fort Norman	21	18
Fort Good Hope	21	17
Fort Simpson, Norman Wells, Fort Franklin and Inuvik	36	36
	100	100

Table 4

Physical Facilities Required (1980)

	Size (Square Feet)	Approximate Cost	
		Buildings $	Equipment $
Wrigley			
Service Station	1,400	60,000	8,600
Motel	10,400	312,000	48,000
Restaurant	2,000	60,000	40,000
	13,800	432,000	96,600
Fort Norman			
Service Station	900	40,000	8,600
Motel	10,400	312,000	48,000
Restaurant	2,000	60,000	40,000
	13,300	412,000	96,600
Fort Good Hope			
Service Station	900	40,000	8,600
Motel	10,400	312,000	48,000
Restaurant	2,000	60,000	40,000
	13,300	412,000	96,600

2.5 Organization

Section 7 examines the possible ways of organizing the construction and operation of these service units and proposes the following plan of action:

* incorporate "Mackenzie Valley Motels Ltd.," 49% owned by an Investor/Operator and 51% owned by native group(s);
* pay-in equity capital in direct relationship to share of ownership;
* provide the Investor/Operator with an extended management contract for the operation of the "Mackenzie Valley Motels Ltd.";
* obtain loan funds from the Department of Indian and Northern Affairs through the Indian Economic Development Fund;
* construct the motel and restaurant facilities at the chosen locations;
* enter into a contract with a major oil company to construct the service station facilities required;
* select local operators, provide training in similar on-going businesses and lease the facilities to them. The lease would be set at a rate sufficient to provide a reasonable rate of return on the "real estate" developments;
* enter into a "franchise-type" contract with each operator to provide management assistance and on-going training, centralized buying, promotion, management and financial control systems and access to working capital in return for fixed charges and a portion of gross revenues.

2.6 Financial Viability

Section 8 examines approximate projections of income and profit for the operating units and for the "Mackenzie Valley Motels Ltd." Holding Company.

The consolidated profit and loss statement for the three operations shows a healthy profit after taxes in the first year of operation as well as growth of profits in the 1980-1984 period. If such enterprises were owned (wholly or even partially) by the respective Bands the net returns from the enterprises could have a significant impact on the socio-economic development of the communities, through re-investment. The success of the motel/restaurant/service station operations would provide the needed confidence, enthusiasm and seed capital (i.e. from

profits of the enterprises) to go into other community and/or business ventures.

Table 5

Pro Forma Income Statements
($'000)

	1980	1981	1982	1983	1984
Operations from Three Facilities					
Sales	1,864	1,994	2,134	2,283	2,443
Profit after tax	63	97	118	139	161
Mackenzie Valley Motels Ltd.					
Income	343	346	356	384	403
Profit after tax	22	35	45	57	70
Cash flow	143	156	169	189	207

The profit and loss statement of the Mackenzie Valley Motels Ltd. shows a modest profit in the first two years of operations rising to more respectable levels thereafter. It is claimed to be modest in light of the fact that so far no allowance for fees and/or return on investment has been made for the Operator or Owner/Manager.

If the Owner/Operator is asked to invest 10% of the total capital required for the venture ($1.55 million) in return for a 49% share of the Mackenzie Valley Motels Ltd., then his return on his capital investment would have to average about $30,000 per year (18%-20%) for the 1980-1984 period. This level of return is not realized until the 1982-1984 period; thereafter, a healthy rate of return is maintained.

In the absence of equity participation the operator would have to collect a fee for his services. The level of fees would, in all probability, equal about 10% of gross revenue of Mackenzie Valley Motels Ltd.; starting out at $34,000 for 1980 and rising to $40,000 by 1984.

As the Mackenzie Valley Motels Ltd. is, strictly speaking, a service organization not owning any assets apart from a service contract with respect to the operations of the three roadside services, it may be difficult to attract an Investor/Manager; nor is it necessary, as the recommended 10% fee of gross revenue should be sufficient

incentive to obtain close vested interest in the operations of the business, on the part of the Manager.

In the case of the latter course of action, the advantage is that the roadside Owner/Operators would also own 100% of the Mackenzie Valley Motels Ltd.; the only disadvantage is that the grant portion from the Indian Economic Development Fund would need to be increased from 10% to 20%, i.e. from $155,000 to $310,000.

2.7 Timing and Action Program

Section 9 outlines a recommended blueprint for the implementation of the Mackenzie Valley Motels Ltd. project.

3. BACKGROUND

3.1 The Travel Industry in the Northwest Territories

The travel industry caters to three main groups of people: the tourist or non-resident leisure traveller; the non-resident business or government traveller; and the resident leisure traveller.

About 22,000 tourists visited the N.W.T. in 1973 spending more than $6 million on transportation, food and accommodation. An estimated 60% of these tourists arrived by road, mostly to enjoy a relaxing vacation and outdoor activities such as fishing, camping, and canoeing. The remaining 40% came by air and many of these were on inclusive tours or visiting specialized fishing lodges and hunting outfitters.

Based on a sampling of about one-half of the hotels, business and government travellers spent a total of about 320,000 bed-nights, almost 90% of the total. The guests stayed an average of 2.2 days but many stayed in more than one hotel. Altogether, the average occupancy for hotels and motels was about 45%, based on bed capacity rather than room occupancy. It is also interesting to note that 85% of the available bed capacity is located in the District of Mackenzie and that capacity for the whole N.W.T. increased by 24% over 1972 levels.

The tourist industry has been expanding rapidly

from an estimated 3,500 in 1963 to 22,000 in 1973. Using regression analysis the average annual growth rate has been about 21% per year. Continued growth at this rate would result in about 100,000 tourists by 1980, but it is generally accepted that the rate of growth will slow down and most sources now project about 50,000 tourists by 1980 (see Exhibit I).

3.2 The Mackenzie Highway

Exhibit II shows the present highway system and also the extensions and new highways that are planned for the Northwest Territories. The Mackenzie Highway reached Fort Simpson in 1970 and early plans called for the extension to be completed to Inuvik by about 1980. This date was used as a base for the calculations although, as pointed out in section 9.1, the actual completion date may be about 1986.

The highway which will cost more than $100 million, will open up a sparsely populated area that until now has been accessible only by aircraft or boat in the summer months, and temporary roads constructed in the winter with packed snow and ice. For tourists and other travellers the new road will open a wilderness area with scenic attractions and good hunting and fishing. If recommendations of a special Roadside Services Committee are followed, the highway will be served by frequent and well-planned roadside rest stops, campgrounds and service areas and should become a major tourist attraction in its own right.

3.3 The Dempster and Liard Highways

In addition to the Mackenzie Highway, construction is already underway on the Dempster Highway which will join Dawson and Inuvik. This road should be completed in 1976 and will provide the first all-weather road to the Mackenzie Delta region. When the Mackenzie Highway is completed, these two roads together will provide an alternate route to Alaska which will be only about 300 miles longer from Edmonton than the present route along the Alaska Highway. The chance to make a circle route and visit the Mackenzie Delta, Arctic Ocean and Mackenzie Valley at the same time should prove attractive to many tourists planning to visit Alaska.

In 1973 there were 66,000 highway tourists who visited Alaska; and the number has been growing at 13%

EXHIBIT 1

TOURIST VISITORS TO THE NWT
(1963-1973)

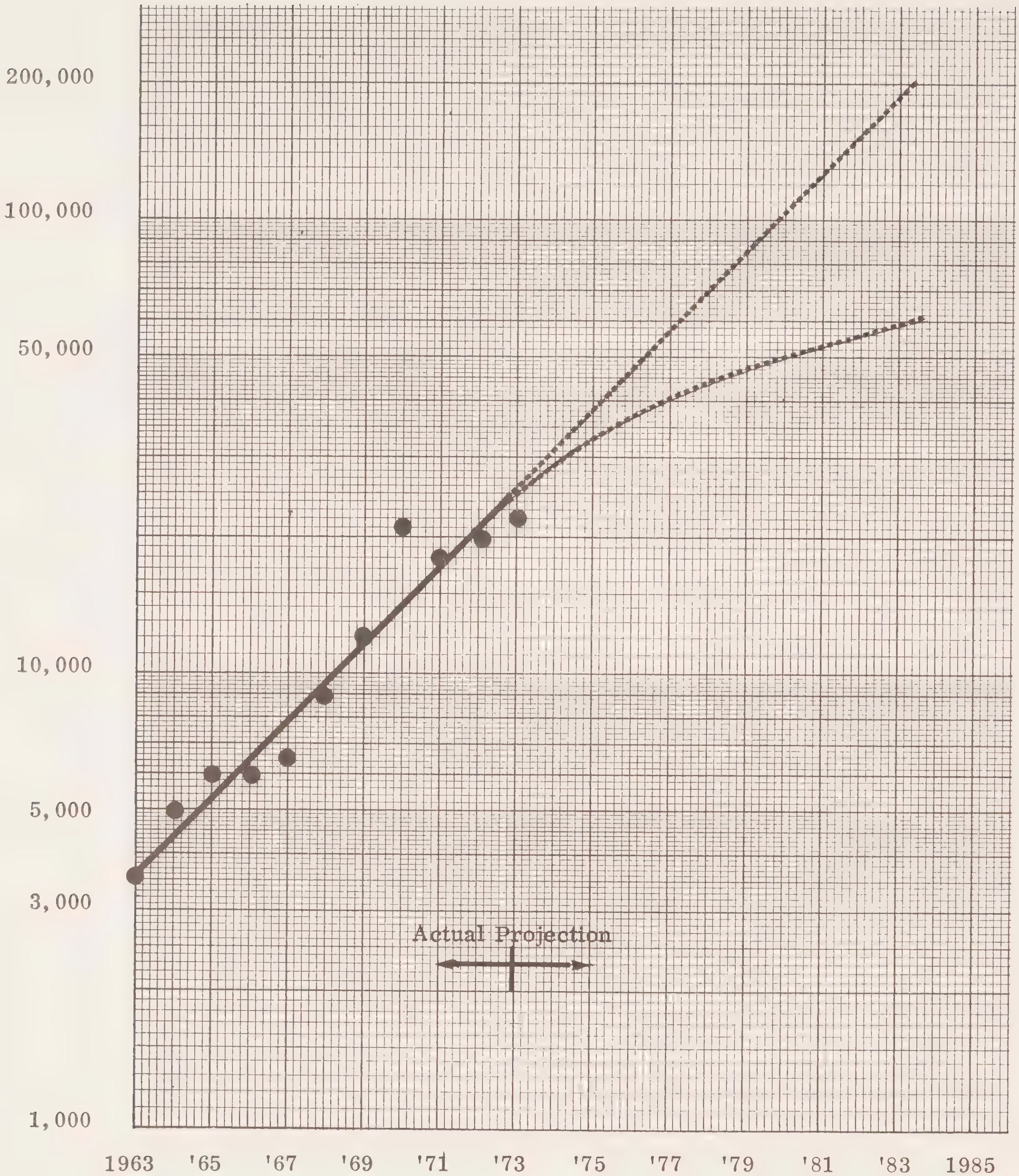
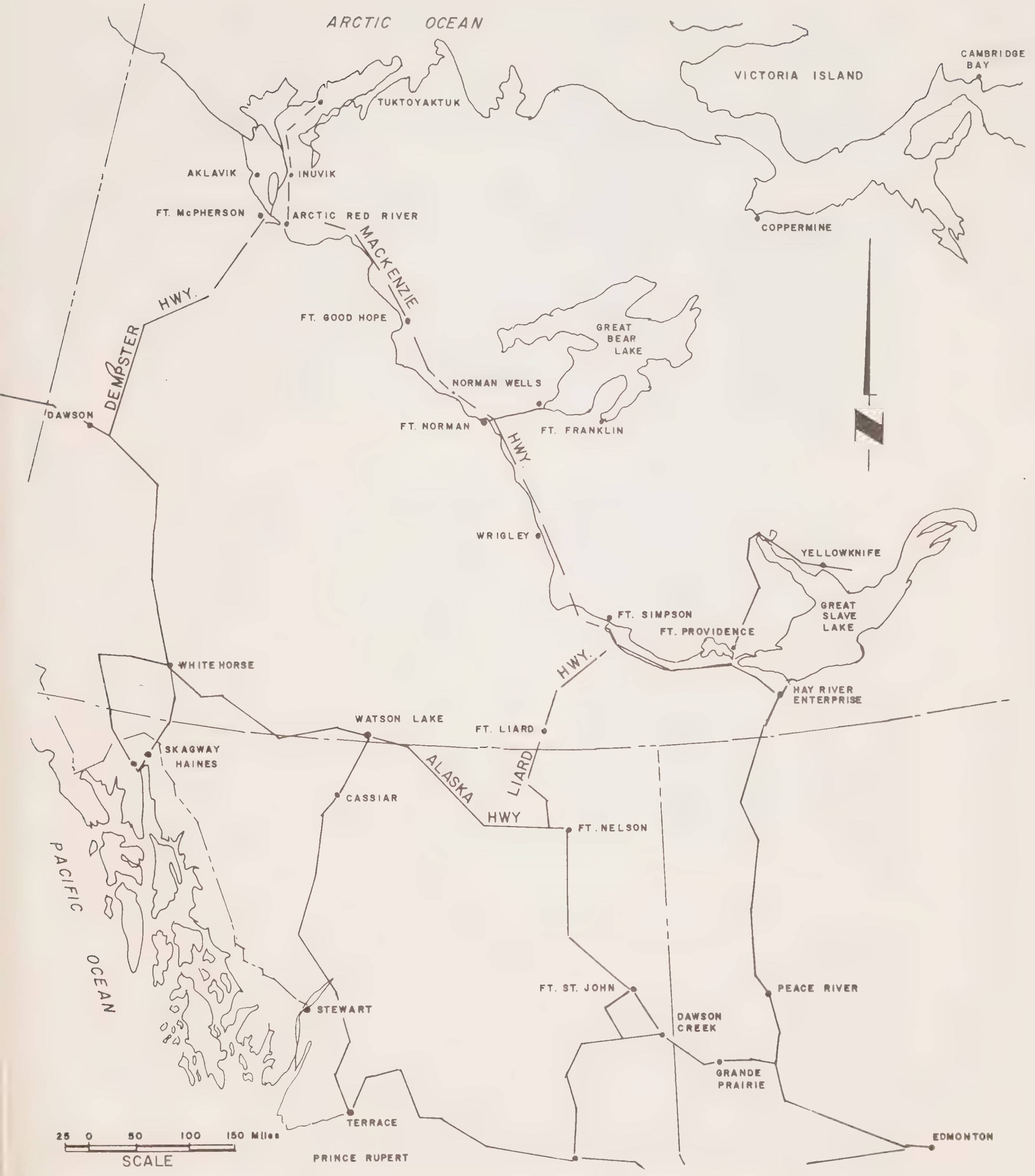


EXHIBIT 2

NORTHERN HIGHWAY SYSTEM



per year since the early 1960's. If this rate of growth continues, by 1980 there should be about 155,000 highway tourists visiting Alaska. If only 10% of these make the return trip via the Dempster/Mackenzie Highways, this in itself will be equivalent to more than the present number of highway tourists visiting the Northwest Territories.

Although plans have not yet been formulated, it is expected that a highway will soon be constructed from near Fort Nelson, B.C. through the Liard Valley to intersect the Mackenzie Highway near Fort Simpson. This Liard Highway would provide access to scenic attractions including the proposed Nahanni National Park and should have considerable tourist appeal. It also could be used as part of the Liard/Mackenzie/Dempster route to Alaska. Both the Liard and Dempster Highways will considerably enhance the commercial and tourist use of the Mackenzie Highway.

3.4 Existing Services on Mackenzie Highway Route

Most of the communities along the route of the Mackenzie Highway extension have some services but they are limited, especially in the smaller predominatly native communities. Exhibit III is a brief summary of the motels, hotels and restaurants now in operation.

Fort Simpson, Norman Wells and Inuvik are quite well served at the present and expansion and new developments should keep up with the increasing demand in general and the increased business expected as a result of the highway developments in particular. The construction of a natural gas pipeline in the Mackenzie Valley would affect these three communities considerably. The resulting construction of accommodation and food services should ensure that adequate capacity will be available by about 1980.

The remaining four communities have a total bed capacity of 28 between them. One of the communities, Fort McPherson on the Dempster Highway, is presently being examined for possible hotel development by the Department of Indian and Northern Affairs. The communities of Wrigley, Fort Norman and Fort Good Hope have also been examined for possible tourist development, but no plans have yet been made. Although most observers find it difficult to forecast the exact magnitude of traffic that will flow along the highways when they are completed, most agree that there will be considerable use of the road and that basic services to travellers will have to be provided or expanded

EXHIBIT 3

EXISTING ACCOMMODATIONS IN THE MACKENZIE VALLEY

Fort Simpson	*	Fort Simpson Hotel: capacity 56, coffee shop, licensed dining lounge, cocktail lounge.
	*	Sub-Arctic Inn: coffee shop, licensed dining room, cocktail lounge.
Wrigley	*	Petanea Cooperative Cabins: capacity 8, coffee shop.
Fort Norman	*	Motel: capacity 10, coffee shop.
Norman Wells	*	Mackenzie Mountain Lodge: capacity 60, cocktail lounge, dining lounge, coffee shop.
Fort Good Hope	*	Coffee shop.
Fort McPherson	*	Flemming Hall: hostel, can accomodate transient adults; meals available.
Inuvik	*	Arctic Inn: capacity 50, licensed steak house.
	*	Eskimo Inn: capacity 185, two cocktail lounges, licensed dining room, coffee shop.
	*	Mackenzie Hotel: capacity 100, cocktail lounge, licensed dining room, coffee shop.

in these communities due to the vast distances involved, the isolation and the severe winter climate.

A special Roadside Services Committee composed of members from the Department of Indian and Northern Affairs and the Government of the Northwest Territories is in the process of designing a plan for the development of services along the highway from a service and user need basis. The remainder of this report examines these services primarily from a business point of view: What is the likely demand for fuel, food and accommodation in total? Where should facilities be located and what share of the business would each receive? Would these businesses be profitable? Taking into account the resources of the communities how can these facilities be organized and operated?

4. DEMAND FOR SERVICES

As sections of the Mackenzie Highway are completed and opened to traffic a flow of tourists, trucks and other vehicles can be expected almost immediately. By about 1980, when the highway to Inuvik is scheduled for completion, traffic should pick up even more. In addition to the travellers arriving by road, there will probably be considerable numbers of people arriving by plane for both business and pleasure reasons. The fastest growing segment of the entire travel industry in the Northwest Territories is air tourism, and with the provision of good facilities and activities these people could easily be attracted to the Mackenzie Valley. The largest user of services throughout the N.W.T. is business and government which used an estimated 89.5% of all the motel and hotel accommodation business in 1973. These travellers who presently are about the only visitors to the small valley communities should also be present in larger numbers in 1980.

A number of studies have been conducted to examine the tourist potential in the Mackenzie Valley. The Roadside Services Group (Roadside) has also made a study of the demand for services. Two studies have been made from a transportation point of view and these also provide useful projections and forecasts of demand over the next ten years. Rather than add another set of projections, we have used all the sources and combined them with the

personal estimates of travel experts, primarily from the Government of the Northwest Territories, to obtain high, low and mean most probable traffic estimates for 1980.

For our purposes we have divided the total market into five segments: highway tourists; air and water tourists; turcks; residents; and business and government. We have used six major sources: "Forecast of Highway Users in the Northwest Territories - Preliminary Findings," Indian and Northern Affairs, June 1974 (INA); "Study of the Tourism Potential for the Mackenzie Valley Communities," Acres Consulting Services Limited, May 1974 (Acres); "Economic Study of Transportation in the Mackenzie River Valley," Travacon Research Limited (Travacon); "Hay River Industrial Development Study Transportation Projections for Hay River," Stanley Associates Engineering Ltd., March 1974 (Stanley); "Overview Study of Tourism and Outdoor Recreation in the Northwest Territories," W.M. Baker and the Division of Tourism, Government of the N.W.T., March 1974 (Baker); and lastly, personal estimates by the staff of the Government of N.W.T. and the study team (N.W.T./RMC).

Exhibit IV shows the estimated volume for each market segment. The detailed calculations showing how these figures were derived from the sources are shown in Appendix I. Using all the available sources, the high, low and mean estimates were calculated (Table 6).

Table 6

Mackenzie Valley Travellers, 1980 Projections

	Low	Mean	High
Highway Tourists (persons)	9,300	14,000	24,700
Trucks (trucks)	1,500	4,400	9,700
Air and Water Tourists (persons)	4,500	6,400	8,250
Residents (thousand vehicle miles)	2,100	2,620	3,280
Business and Government (persons)	3,100	6,200	9,300

Each type of traveller will require different amounts of each service; for example all the highway tourists will need gasoline, but most of them will be camping or in self-contained units and their use of motels and restaurants will be quite low. For each of the major services required, namely, accommodation, food and fuel, we have calculated the demand from each market segment. In all cases the high and low were calculated by adding

EXHIBIT 4

PROJECTED TRAFFIC ON THE MACKENZIE HIGHWAY EXTENSION (1980)

A. HIGHWAY TOURISTS

Acres	13,800 to 20,700	persons
INA	9,300	persons
NWT/RMC	10,000	persons
Travacon (maximum)	24,700	persons

B. TRUCKS

INA	2,000	trucks
Travacon	1,500 to 8,000	trucks
Stanley	3,000 to 9,700	trucks

C. AIR TOURISTS

Acres	4,500 to 8,250	persons

D. RESIDENTS

INA Roadside (tourists)	1,600,000	vehicle miles
Travacon (local)	1,020,000	vehicle miles
	2,620,000	(± 25%)

E. BUSINESS & GOVERNMENT

NWT/RMC	13,700	(± 50%) bed nights

or multiplying the extremes to each other. For example, in calculating the probable low estimate of motel usage by highway tourists, we have used the low estimate of numbers of tourists - 9,300 persons, the low estimate of motel users - 7%, and the low estimate of length of stay—four days, to calculate the extreme low of 2,600 bed-nights. Using the same method for the high figure the result is 26,000 bed-nights. Obviously this method tends to compound the extremes and results in an improbably high "high estimate" and similarly for the low estimate. This type of calculation can only be done accurately by computer and the forecasts and estimates are subject to a fairly large probable error.

Assuming that all the variables are independent we therefore have adjusted these extremes. The low and high figures should now represent 80% confidence levels, or in other words, there is about a one in five chance of the actual result being below the low estimate and a one in five chance that it will be above the high estimate. The calculations are shown in Appendix II and are summarized in Table 7. These figures show the demand for services between Fort Simpson and Inuvik along the completed Mackenzie Highway. In most cases this is exclusive of demand actually in Fort Simpson or Inuvik but occasionally there would be some overlap.

Table 7

Projected Demand for Services (1980)

	Low	Mean	High
Hotel/Motel (bed-nights)	35,000	50,000	75,000
Gasoline (gallons)	500,000	700,000	1,100,000
Diesel Fuel (gallons)	300,000	950,000	2,400,000
Restaurant (meals)	130,000	200,000	300,000

5. MARKET SHARE TO EACH LOCATION

5.1 Location of Facilities

As discussed earlier, between Fort Simpson and Inuvik, only one community, Norman Wells, presently has

sufficient capacity to begin to handle these traffic projections. Looking at Exhibit V, it appears that by virtue of distance alone services will have to be provided between Fort Simpson and Norman Wells, 336 miles, and between Norman Wells and Inuvik, 339 miles. Economically, and socially, it makes the best sense to locate the facilities in or near existing communities whenever possible.

Between Fort Simpson and Norman Wells, Wrigley would be the best spot and possibly also Fort Norman, although it is only 50 miles from Norman Wells. Between Norman Wells and Inuvik, Fort Good Hope would seem the best location with possibly some facility at the intersection of the Dempster Highway in the future. As outlined in section 7, "Organization", (and the concept of a "chain-like" group of service centers—subject to the profit analysis carried out in Section 8), we recommend major service facilities providing accommodation, food and fuel at Wrigley, Fort Norman, and Fort Good Hope.

Assuming facilities at Norman Wells, this would provide services at four locations along the highway. The average distance between service facilities would be about 135 miles and the longest distance without services would be about 250 miles. This meets the minimum service requirement and, depending on the actual demand, should maximize the profit potential of each location.

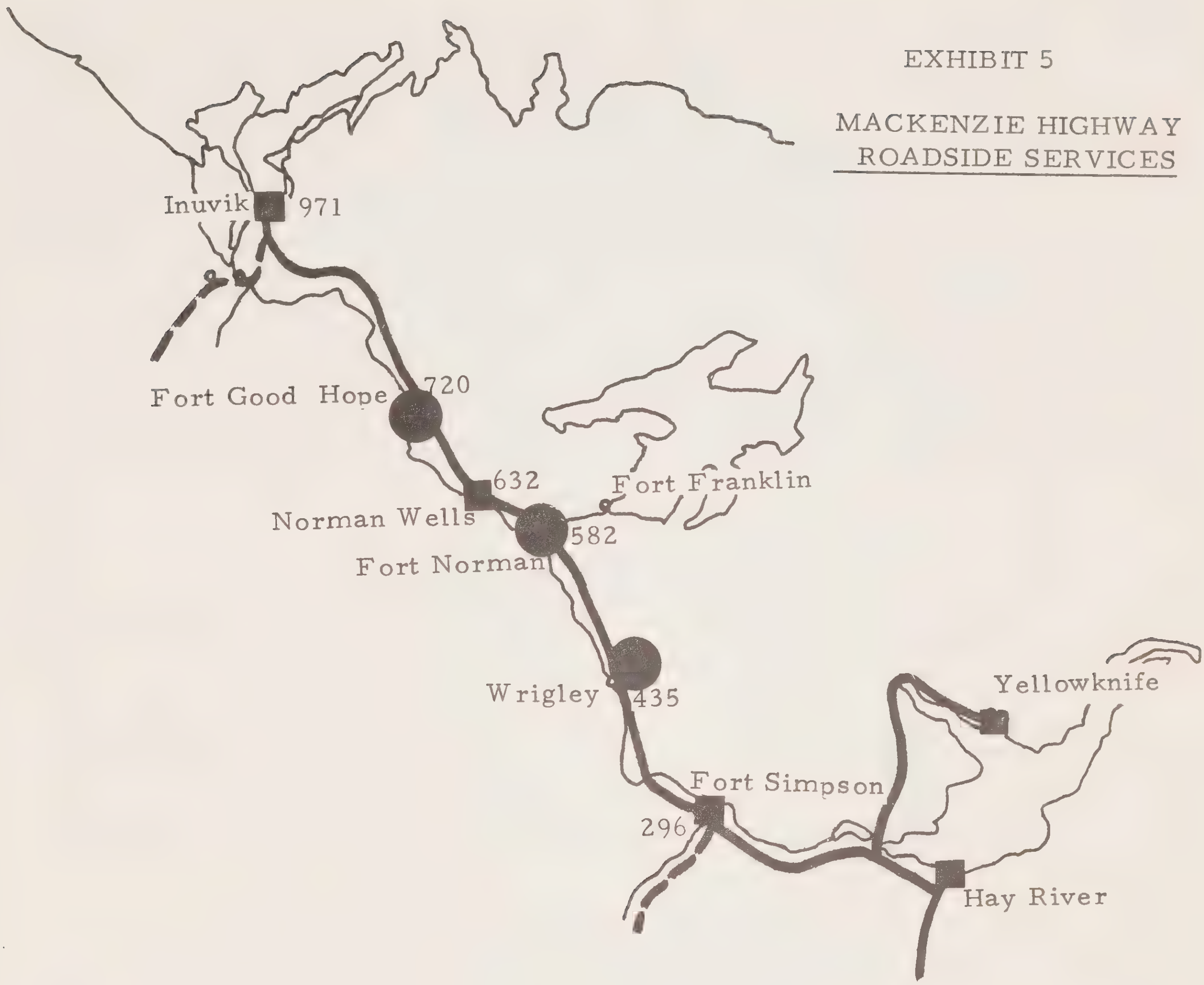
Although this report does not examine specific locations within each community it should be mentioned that from both commercial and social points of view there are advantages and disadvantages to a location on the highway as opposed to a location within the community. The specific site location should be determined by the local operator and the people of the community.

5.2 Share of Market at Each Location

5.2.1 Fuel

Assuming attractively designed and well-operated major service units at Wrigley, Fort Norman, Norman Wells, and Fort Good Hope, and the highway completed to Inuvik, we can make rough estimates of the share of market which each community would capture.

Gasoline sales can be calculated reasonably easily based on the distance from the last gas station if we assume that the average motorist will fill up his



296 - Mileage Posts (Mackenzie Highway)

● - Recommended Major Service Area (Motel, Restaurant and Service Station)

■ - Existing Major Service Areas

Source: Public Works, Canada, June 1974, "Mackenzie Highway, Northwest Territories".

Table 8

Distribution of Gasoline Sales Calculation

	Round Trip Miles From Previous Community	Gallons Required by Each Vehicle							Total Gallons of Gas Consumed
		a	b	c	d	e	f	g	
Fort Simpson	-	-	-	-	-	-	-	-	-
Wrigley	139	13.9	13.9	13.9	13.9	13.9	13.9	13.9	97.3
Fort Norman	147	14.7	14.7	14.7	14.7	14.7	14.7		88.2
Norman Wells	50	5.0	5.0	5.0	5.0	5.0			25.0
Fort Good Hope	88	8.8	8.8	8.8	8.8				35.2
Inuvik	251	25.1	25.1	25.1					75.3
Fort Good Hope	251	25.1	25.1	25.1					75.3
Norman Wells	88	8.8	8.8	8.8	8.8				35.2
Fort Norman	50	5.0	5.0	5.0	5.0	5.0			25.0
Wrigley	147	14.7	14.7	14.7	14.7	14.7	14.7		88.2
Fort Simpson	139	13.9	13.9	13.9	13.9	13.9	13.9	13.9	97.3
									647.0

Average length of trip: 642 gal x 10 mile/gal ÷ 7 vehicles = 917 miles

Gasoline Sales Per Community

(from vehicle use on the Mackenzie Highway between Fort Simpson and Inuvik only)

Community	Gallons	Percentage
Fort Simpson	97.3	15.2
Wrigley	185.5	28.9
Fort Norman	113.2	17.6
Norman Wells	60.2	9.4
Fort Good Hope	110.5	17.2
Inuvik	75.3	11.7
	642.0 gallons	100.0%

tank at each stop (Table 8 shows this calculation). Miles from the last stop are converted to gasoline by assuming an average of 10 miles per gallon. This may seem low but considering the large number of campers and trailers being pulled, it should be a reasonable average. It is also assumed that all the motorists make round trips and that out of seven* vehicles leaving Fort Simpson, three or slightly less than half would make the trip all the way to Inuvik and the remaining four would go as far as Fort Good Hope, Norman Wells, Fort Norman and Wrigley, respectively. This given an average trip length of 917 miles which is quite close to the average 880 miles used in calculating total demand. This demand does not allow for vehicles which continue on the Dempster Highway. The resulting distribution by community is shown in Table 9.

Table 9

Distribution of Gasoline Sales

Community	Sales
	%
Wrigley	79
Fort Norman	18
Fort Good Hope	17
Fort Simpson, Inuvik and Norman Wells	36
	150

Sales of diesel fuel could be more variable since the trucks have a much longer range, but for our purposes we have assumed the same distribtuion as for gasoline.

It should be noted here that for the most part the estimates for motel nights, restaurant expenditure and gasoline requirements are for travellers on the highway between, but not including, Fort Simpson and Inuvik; however, there will be some loss of business to these larger communities and an allowance has been made.

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*Seven is used in the model because it yields average trip length (917 miles) which is close to the 880 miles used in calculating total demand.

Table 10

Distribtuion of Motel Use Calculation

	Fort Simpson	Wrigley	Fort Norman	Norman Wells	Fort Good Hope	Inuvik or Fort Franklin	Total[1]
Highway Tourists							
a. Gasoline Distribution	15%	29%	18%	10%	17%	12%	100%
b. Recreation Terrain[2]	51	79	72	75	56	56	
c. Recreation Interest[2]	1	1	6	4	4	4	
d. Total (b) 10 x (c)	61	89	132	115	96	96	589
e. (d) in % Distribution	10%	15%	22%	20%	16%	16%	100%
f. Average (a) and (c)	12.5%	22%	20%	15%	16.5%	12%	100%
Trucks							
g. Gasoline Distribution	15%	29%	18%	10%	17%	12%	100%
Air Tourists[3]							
h. Recro-tourist index (d)	-	89	132	115	96	96	528
i. (h) in % (Distribution)	-	17%	25%	22%	18%	18%	100%
Business and Government[3]							
j. Population Distribution	-	15%	23%	31%	31%	-	100%
Highway Tourists (17%) x (f)	.021	.037	.034	.026	.028	.024	.17
Trucks (35%) x (g)	.054	.104	.065	.036	.061	.043	.36
Air Tourists (19%) x (i)	-	.032	.048	.042	.034	.034	.19
Business and Government (38%) x (j)	-	.042	.064	.087	.087	-	.28
	.075	.215	.211	.191	.210	.101	1.00

[1] Total may not add due to rounding.

[2] Land Use Information Series, 1972.

[3] Estimates of air tourists and business and government travellers do not include visitors to Fort Simpson and Inuvik.

5.2.2 Accommodation

The market share captured by each location for motel use is somewhat more difficult to calculate as it is affected by a combination of distance, tourist attractions, business opportunities and the quality of the facilities themselves. The distribution for highway tourists and truckers will be similar to the distribution for gasoline sales, although scenic attractions and the presence of good tourist facilities would favour certain locations more than others. Air tourists would be even more influenced by the "recro-tourist" attractions. Business and government travellers would be distributed roughly in proportion to the population of the communities although exploration activity or large scale developments could affect this component significantly.

In Table 10 we have attempted to quantify these factors and to calculate the distribution of motel use for each market segment. For highway tourists we have assumed that the distribution would be the average of the distribution of gasoline sales and a distribution based on "recro-tourist" appeal. This is calculated by adding the recreation-terrain evaluation and recreation interest spots for each location (Land Use Information Series, 1972 prepared by the Department of the Environment).

For truckers the distribution is based solely on distance and gasoline sales; for air and water tourists the distribtuion is based on the "recro-tourist" index; and for business and government, it is based on the population of the communities. Finally all these individual distributions are weighted according to the size of the particular market segment and an overall expected distribution is found. The results are summarized in Table 11. Demand for restaurant meals should follow approximately the same pattern as that calculated for motels and therefore we will assume that the distribution in Table 11 would also hold true for restaurant sales.

Table 11

Distribution of Motel Bed-nights

Fort Simpson	8%
Wrigley	22
Fort Norman	21
Fort Good Hope	21
Fort Franklin and Inuvik	10
Norman Wells	19
	100%

6. FACILITIES REQUIRED (1980)

Using the total demand figures estimated in Section 4 and the share of market calculations from Section 5, we should be able to estimate the physical facilities which will be required at each location.

One feature of travel in the Northwest Territories which has not yet been mentioned is the rather severe seasonal fluctuations which result in a large portion of the total year's business coming in the summer, especially in July. The Indian and Northern Affairs Roadside Services study estimates that about 35% of the tourists, 17% of the truckers and 13% of the residents travelling would occur during the month of July. It is assumed that about 15% of the business and government travel also would take place in July. In Table 12 these figures are used to calculate the weighted average use for each of the services during the month of July. The results show that 27% of gasoline sales, 23% of restaurant and motel use and 17% of diesel fuel sales would occur in July. This will mean that most of the facilities will be considerably underutilized during the remainder of the year; this is an unfortunate extra cost of doing business in the North and must be absorbed.

Table 12

Peak Month Demand Calculation

Motel Bed-nights	Projected Demand (bed-nights)	July Demand (bed-nights)	July Demand %
Tourists	8,400	2,940	35
Truckers	17,600	2,990	17
Air Tourists	9,600	3,360	35
Business and Government	13,700	2,050	15
	49,300	11,340	23
Gasoline	**Projected Demand (gallons)**	**July Demand (gallons)**	**July Demand %**
Tourists	425,000	148,800	35
Residents	262,000	34,100	13
	687,000	182,900	27
Diesel Fuel			
Trucks	968,000	164,600	17

It was estimated (in Table 10) that Wrigley would capture 22% of the motel and restaurant business and 29% of the gasoline and diesel fuel sales. This indicates a facility capable of providing 11,000 bed-nights, 44,000 meals, 203,000 gallons of gasoline and 275,000 gallons of diesel fuel as shown in Table 13.

Table 13

Projected Demand at Wrigley (1980)

	Total Projected Demand	Wrigley Share %	Projected Demand at Wrigley
Motel (bed-nights)	50,000	22	11,000
Restaurant (meals)	200,000	22	44,000
Gasoline (gallons)	700,000	29	203,000
Diesel Fuel (gallons)	950,000	29	275,500

For the motel, 23% of this business activity or 2,530 bed-nights, will be concentrated in the month of July. If we assume an average capacity of 90% during July this would indicate a need for 91 beds. At an average of two and a half beds per room, 37 rooms would be needed. It should be noted that 90% capacity on a bed basis is very full and means that occasionaly on peak July days people will have to be crowded into rooms, temporary beds set out or perhaps some people turned away; nevertheless the motel can only be profitable if capacity is fully utilized during the peak periods of the year. Based on the forecast demand and a motel of 40 rooms, the average annual rate of occupancy would be about 30% on a bed capacity basis. This does not compare very well with the territorial average of 45% reported by the N.W.T. Division of Tourism. Assuming 260 square feet per room* and a cost of $30 per square foot, the building would cost about $312,000. An additional cost of about $1,200 per room for fixtures would bring the total capital cost to about $360,000.

Similarly the restaurant would serve an average of 327 meals per day during July and would therefore require

*Hotel Feasibility Study, Fort McPherson; Leventhol, Krekstein, Horwath and Horwath, May 1973.

about 60* seats or about 1,920 square feet of space. Assuming 2,000 square feet the cost would be about $60,000. Allowing another $40,000* for equipment and furnishings, the total capital cost would be about $100,000.

A service station selling 203,000 gallons of gasoline would require a building of about 1,400 square feet with two service bays, four gasoline pumps, to handle the summer peak and one diesel pump. The total capital cost for the building, equipment and tools would be about $70,000.

The total capital cost for the motel, restaurant and service station at Wrigley without any allowance for land, would be about $530,000. Similarly Fort Norman and Fort Good Hope would require about the same facilities except for the gas station which would only have to be about 900 square feet with one service bay, two gasoline pumps and one diesel pump. Total capital cost exclusive of land for each location would be about $500,000. This is summarized in Table 14.

Table 14

Physical Facilities Required (1980)

	Size	Approximate Cost	
	(Sq.Ft.)	Buildings $	Equipment $
Wrigley			
Service Station	1,400	60,000	8,600
Motel	10,400	312,000	48,000
Restaurant	2,000	60,000	40,000
	13,800	432,000	96,600
Fort Norman			
Service Station	900	40,000	8,600
Motel	10,400	312,000	48,000
Restaurant	2,000	60,000	40,000
	13,300	412,000	96,600
Fort Good Hope			
Service Station	900	40,000	8,600
Motel	10,400	312,000	48,000
Restaurant	2,000	60,000	40,000
	13,300	412,000	96,600

*Industry Sources and Statistics.

7. ORGANIZATION

Having established that the opportunity and need for certain services will exist when the Mackenzie Highway is opened, we should examine possible methods for setting up and operating the facilities.

The easiest and most usual approach would be to adopt a laissez-faire policy, encouraging individual entrepreneurs to assess the opportunity and, in turn, to take advantage of it. Unfortunately there is a danger that this approach would lead to a relatively large number of smaller units each only marginally profitable. This in turn would probably lead to low cost construction methods and poor quality services. This approach would not involve the Government in any way and could be taken in conjunction with a program to assist local and native entrepreneurs. Although a land settlement might change the ground rules considerably, it must be assumed for the present time, as a result of Federal policy, development along the Mackenzie Corridor near the predominantly native communities will be reserved on at least a first refusal basis for native entrepreneurs.

To counter the danger of many small uneconomic units the Federal and Territorial Governments could work together and establish one service station, one motel, and one restaurant at each location. Depending on the people available, this could be run by one, two or three individual operators. Through a financing plan or by actually building the facilities and leasing them, the Governments, directly or through an agency, could provide first class facilities to the operators; most of whom would probably not have sufficient capital of their own. This approach could be repeated at each location where services were needed. Financing for the service stations would probably not be required since it is normal policy for oil companies in the North to build the facilities and to lease them back to the independent Operators.

The Government or government agencies could remove themselves from direct contact with the individual Operators through the creation of a Corporation which would build the facilities and lease them to the Operators. This Corporation would be run on a profit making basis and would: provide the physical facilities, provide overall management assistance and coordination, ensure conformity to quality standards, provide centralized buying and inventory facilities, and provide promotion and tour-booking

arrangements. In effect, the Corporation would act like a motel chain, aggressively promoting its facilities and looking for new opportunities. The individual Operators would be independent and their income would be based on the performance of their operation. Over time these Operators could purchase the facilities out of their profits.

The Holding Company could be financed through a combination of private, government and native funds. Ideally, it would be managed by one of the equity partners under a management contract. There is a wide range of possible choices for this part of the organization. A large southern chain could provide the capital, expertise and probably the access to training facilities, but might be short on "northern experience" and would be somewhat unattractive politically.

An existing northern entrepreneur or hotel operator would probably have the required expertise but might be short of capital and weak in the area of training. There are also a number of hotel corporations such as Hallmark Hotels that specialize in training an entire staff and starting hotels from scratch especially in underdeveloped countries.

We recommend the following structure and general approach:

* Incorporate "Mackenzie Valley Motels Ltd." 49% owned by the Investor/Operator and 51% owned by a native group(s).
* Pay-in equity capital in direct relationship to share of ownership.
* Provide the Investor/Operator with an extended management contract for the operation of "Mackenzie Valley Motels Ltd."
* Obtain loan funds from the Department of Indian and Northern Affairs through the Indian Economic Development Fund.
* Construct the motel and restaurant facilities at the chosen locations.
* Enter into a contract with a major oil company to construct the service station facilities required.
* Select local Operators, provide training in similar on-going businesses and lease the facilities to them. The lease would be set

at a rate sufficient to provide a reasonable rate of return on the "real estate" developments.

* Enter into a "franchise-type" contract with each operator to provide management assistance and on-going training, centralized buying, promotion, management and financial control systems and access to working capital in return for fixed charges and a portion of gross revenues.

8. FINANCIAL VIABILITY AND SOURCES OF FUNDS

8.1 Leasing Arrangements

As estimated in section 6, the capital costs, exclusive of land, would be about $530,000, $500,000 and $500,000 in Wrigley, Fort Norman and Fort Good Hope respectively. About $100,000 of this would be for equipment and furnishings at each location. The total cost of all three units would be about $1,546,000 of which $290,000 would be for equipment and furnishings. Depending on the actual debt-equity ratio and the rate of interest on the loans, the lease on the facilities could be about 16% and the capital cost per year and the lease on the equipment and furnishings could be about 31%. This is calculated assuming that 80% of the capital is obtained from loans at 9% and that the Investors earn a return of 18% on their equity contribution (Table 15).

8.2 Projected Profit and Loss - Operations

Using these amounts for the lease payments we can calculate the income and resulting profit of the proposed facilities. Table 16 shows the projected sales and profit of a combined restaurant and motel at Wrigley. Using the projected total demand and the market share expected for Wrigley (22%) and an average of $18 per bed-night and $3.50 per meal, total sales are estimated at $350,000 of which about $200,000 would remain after paying the variable operating costs. This calculation of operating costs assumes the labour force would be adjusted to meet requirements from month to month as much as possible. For example, including the "fixed" people, the average work force over the whole year would be about 17 people but would almost double in July.

Table 15

Lease Calculation

Buildings		
Cost	$1,256,000	
Required Income		
Depreciation (20 years)		$ 62,800
Return on equity (assume 18% per year on 20% of total cost)		45,200
Interest on loan (assume 9% on 80% of total cost)		90,500
TOTAL		$198,500
Required Lease		15.8%
Equipment and Furnishings		
Cost	$ 290,000	
Required Income		
Depreciation (5 years)		$ 58,000
Return on equity (assume 18% per year on 20% of total cost)		10,500
Interest on loan (assume 9% per year on 80% of total cost		20,900
TOTAL		$ 89,400
Required Lease		30.8%

The payment for management assistance to "Mackenzie Valley Motels Ltd." has been set at 5% of gross sales, although this would have to be refined and negotiated depending on the services provided. Heating and electrical costs have been estimated at $1 per square foot plus an additional $3,000 for the restaurant. This assumes that the motel has been designed to minimize heating costs and also that portions of the building which are not being used during the relatively inactive winter months can be closed down and not fully heated. The leases payable to "Mackenzie Valley Motels Ltd." have been set at 16% on the buildings and 31% on the equipment, and amount to about $87,000 per year. Also an allowance has been made for interest on the working capital required. The resulting profit after taxes to the local Operator is about $19,000. This is a handsome

Table 16

PROJECTED INCOME - MOTEL AND RESTAURANT AT WRIGLEY (1980)

Total Projected Demand	50,000 bed-nights	
	200,000 meals	
Wrigley Share (22%)	11,000 bed-nights	
	44,000 meals	
Gross Sales	$18 per bed-night	$ 198,000
	$3.50 per meal	154,000
		$ 352,000
Operating Margin	63% on hotel *	$ 124,700
	49% on restaurant *	75,500
		$ 200,200
	Less Management Fee (5% of gross)	$ 17,600
		$ 182,600
Fixed Costs	Manager/Operator	$ 20,000
	Reception/Motel	8,000
	Cashier/Restaurant	8,000
	Heating & Electrical	15,300
	Lease on Building (16% x $372,000)	59,300
	Lease on Equipment (31% x $88,000	27,300
	Maintenance/Repair** at 2%	9,200
	Working Capital (12% on 1 month sales)	4,100
	All Other	5,000
		$ 156,400
Profit Before Tax		$ 26,200
Tax (25%)		6,600
	NET PROFIT	$ 19,600

* Adapted from: Edzo Commercial Center Feasibility Study, Underwood McLellan and Associates Limited, October, 1973.

** Major replacement and repair the responsibility of the Mackenzie Valley Motels Ltd.

return when one considers that the Owner/Operator also draws a $20,000 salary. The $26,000 profit before taxes leaves a reasonable margin for unforeseen expenses and/or optimistic assumptions.

Similarly Table 17 shows the projected operating statement for the service station in Wrigley. At $0.78 per gallon of gasoline and $0.75 per gallon of diesel fuel, after tax would be about $11,000. Lease payments on the building and equipment would be about $12,000 per year, although this might be payable to an oil company instead of "Mackenzie Valley Motels Ltd." Also in the case of equipment we have shown it as if the equipment was being leased to the Operator; in actual fact it would probably be preferable from a maintenance and care point of view, for the Operator to own all the equipment and furnishings himself. The costs would not be any different.

As such, if the Wrigley motel/restaurant/service station facility were owned by the same individual it would earn that person a salary of $20,000 plus $32,000 in profits after taxes. Such a facility could also be owned by a Band-run enterprise (e.g. Cooperative) paying the Manager a salary plus a performance bonus (or share ownership, thus dividends) and the balance of the profits could go into other entrepreneurial opportunities and/or community projects.

The motel and restaurant at Fort Norman and Fort Good Hope would each capture about 21% of the market and therefore would have sales of about $336,000. At this level of sales the net profit after tax would be about $13,500. The service stations would have sales of $236,000 and $223,000 and would earn profits after tax of about $2,200* and $1,300*.

Therefore, in total, the three operating units should earn, after tax, profits of about $62,800 on sales of $1,860,000.

---

*Operator's salary dropped to $12,000 to reflect smaller scale of business. In all probability the Owner/Operator of the motel/restaurant would perform some if not most of the functions, thus reducing the salary cost and increasing the profit after taxes at each of the two locations.

Table 17

Projected Income - Service Station at Wrigley (1980)

Total Projected Demand	700,000 gallons gasoline 950,000 gallons diesel fuel	
Wrigley Share (30%)	203,000 gallons gasoline 275,000 gallons diesel fuel	
Gross Sales	gasoline @ .78/gal. plus oil, lubs, tires, batteries, etc.	$174,400
	diesel fuel @ .75/gal.	206,700
		$381,100
Operating Margin	gasoline @ .088/gal. plus oil, lubs, tires, batteries, etc.	$ 27,900
	diesel fuel @ .088/gal.	25,100
		$ 52,000
Fixed Costs	Manager	$ 15,000
	Heating and Electricity	3,800
	Lease on Building (16% x 60,000)[1]	9,600
	Lease on Equipment (31% x 8,600)[1]	2,700
	Maintenance and Repair	2,000
	Working Capital Cost (12% of 1 month sales)	3,900
		$ 37,000
Net Profit Before Tax		$ 15,100
Tax (25%)		3,800
	NET PROFIT	$ 11,300

[1]Based on experience of Yellowknife Service Station Operator.

Adapted from: Establishing Service Stations on Indian Reserves, Indian and Northern Affairs, January 1974.

8.3 Projected Profit and Loss - Entire Operation

In addition to the profits generated by the operating units, the central company, "Mackenzie Valley Motels Ltd." would be earning profits from the revenue generated by the leases and the management contracts, 51% of which would accrue to the Owner/Operator of each of the three facilities. For the sake of simplicity we have assumed that the service stations are also being leased from "Mackenzie Valley Motels Ltd." The total income from the leases would be about $201,000 from the buildings and $90,000 from the equipment. Income from the 5% management contract would be about $51,000 (Table 18).

The expenses of the Corporation would be primarily interest on the loan, an allowance for depreciation and salaries and expenses for a small staff of three. Costs of the buying and inventory activity would be included in the cost of operations for each of the units. On this basis net profit after tax would be $22,500 and cash flow would be about $143,000.

These projections have all been based on 1980 forecasts assuming the highway has been completed through to Inuvik by then (see section 9.1). The estimates can be extended into the future by assuming a growth rate of about 7% per year. This rate which was chosen by the Roadside Services Group, is highly conservative when compared to the (rate) of 21% per year from 1963 to 1973. Also the motel and restaurant facilities would have to be expanded at Wrigley in the third year and at Fort Norman and Fort Good Hope in the fourth year. The leases and interest payments have been adjusted to cover this. The remaining pro forma statements are shown in Table 19.

The consolidated profit and loss statement for the three operations (Table 19) shows a healthy profit after taxes both in the first year of operation and in its growth pattern in the 1980-1984 period. If such enterprises were to be owned (wholly or even partially) by the respective Bands the net returns from the enterprises could have a significant impact on the socio-economic development, through re-investment, of the communities. The success of the motel/restaurant/service station operations would provide the needed confidence/enthusiasm and seed capital (i.e. from profits of the enterprises) to go into other community and/or business ventures.

The profit and loss statement of the Mackenzie Valley Motels Ltd. shows a modest profit in the first two

Table 18

PROJECTED PROFIT AND LOSS
MACKENZIE VALLEY MOTELS LTD. (1980)

Estimated Cost of Buildings	$1,256,000
Estimated Cost of Equipment & Furnishings	290,000
	$1,546,000
Income	
Leases on Buildings (16% x $1,256,000)	$ 201,000
Leases on Equipment (31% x $290,000)	90,000
	$ 291,000
Management Fee 5% of Motel/Restaurant Sales	51,000
	$ 342,000
Expenses	
Interest (9% x $1,236,800)	$ 111,200
Salaries and Travel*	60,000
Office Expenses	10,000
Legal and Audit	10,000
Depreciation	
- buildings (20 year straight line)	62,800
- equipment (5 year straight line)	58,000
	$ 312,000
Profit Before Tax	$ 30,000
Tax (25%)	7,500
NET PROFIT	$ 22,500
Cash Flow	$ 142,800

* Allowance for a President/General Manager ($25,000); Accountant ($15,000); Clerk/Typist ($7,000); plus Travel ($13,000).

Table 19

PRO FORMA INCOME STATEMENTS ($000)
(1980 - 1984)

For the Three Facilities	1980	1981	1982	1983	1984
Sales					
Motel/Restaurant	$1,024	$1,096	$1,172	$1,254	$1,342
Service Station	840	898	962	1,029	1,101
	$1,864	$1,994	$2,134	$2,283	$2,443
Operating Margin					
Motel/Restaurant	$ 532	$ 569	$ 609	$ 652	$ 697
Service Station	115	123	132	141	151
	$ 647	$ 692	$ 741	$ 793	$ 848
Fixed Costs					
Motel/Restaurant	$ 209	$ 209	$ 209	$ 209	$ 209
Service Station	63	63	63	63	63
	$ 272	$ 272	$ 272	$ 272	$ 272
Lease Payments					
Motel/Restaurant	$ 260	$ 260	$ 266	$ 287	$ 297
Service Station	31	31	31	31	31
	$ 291	$ 291	$ 297	$ 318	$ 328
Total Expenses	$ 563	$ 563	$ 569	$ 590	$ 600
Profit Before Tax	$ 84	$ 129	$ 172	$ 203	$ 248
Net Profit After Tax on Operations*	$ 63	$ 97	$ 118	$ 139	$ 161
Mackenzie Valley Motels Ltd.					
Lease Payments	$ 291	$ 291	$ 297	$ 321	$ 336
Management Fee	51	55	59	63	67
	$ 342	$ 346	$ 356	$ 384	$ 403
Fixed Expenses	$ 80	$ 80	$ 80	$ 80	$ 80
Interest *	111	98	87	83	71
Depreciation	121	121	124	132	137
	$ 312	$ 299	$ 291	$ 295	$ 288
Profit Before Tax	$ 30	$ 47	$ 65	$ 89	$ 115
Profit After Tax**	22	35	45	57	70
Cash Flow	$ 143	$ 156	$ 169	$ 189	$ 207
Total Operations					
Total Profit After Tax on Operations & Holding Co.	$ 86	$ 132	$ 163	$ 196	$ 231

* Assume tax of 25% on first $50,000 for each of the three operations, and 50% on remainder

** Assume that the cash flow is used to pay off the loan and that any expansion is financed by additional loans

years of operation rising to more respectable levels thereafter. It is claimed to be modest in light of the fact that so far no allowance for fees and/or return on investment has been made for the Operator or Owner/Manager.

If the Owner/Operator is asked to invest 10% of the total capital required for the venture ($1.55 million) in return for a 49% share of the Mackenzie Valley Motels Ltd. then his return on his capital investment would have to average about $30,000 per year (18%-20%) for the 1980-1984 period. This level of return is not realized until the 1982-1984 period; thereafter a healthy rate of return is maintained.

In the absence of equity participation the Operator would have to collect a fee for his services. The level of fees would, in all probability, equal about 10% of gross revenue of the Mackenzie Valley Motels Ltd.; starting out at $34,000 for 1980 and rising to $40,000 by 1984.

As the Mackenzie Valley Motels Ltd. is, strictly speaking, a service organization not owning any assets, apart from a service contract with respect to the operations of the three roadside services, it may be difficult to attract an Investor/Manager; and it is not necessary as the recommended 10% fee of gross revenue should be sufficient incentive to obtain close-vested interest in the operations of the business on the part of the Manager.

In the case of the latter course of action, the advantage is that the roadside Owner/Operators would also own 100% of the Mackenzie Valley Motels Ltd.: the only disadvantage is that the grant portion from the Indian Economic Development Fund would need to be increased from 10% to 20%, i.e. from $155,000 to $310,000.

9. TIMING AND ACTION PROGRAM

9.1 Timing Considerations

Throughout the report we have been assuming that the highway is completed and open to Inuvik by the year 1980. The actual situation is likely to be more complicated. The highway will likely reach Wrigley and Fort Norman well before 1980 and services at these locations will have to be available. However, the date for completion

to Inuvik is subject to a number of variables including: the timing of construction of the Mackenzie Valley natural gas pipeline; the ability of the major contractor, Hire North, to meet accelerated schedules; and perhaps most importantly the willingness of the Federal Government to commit the required funds. At the time of writing, reliable sources predict that the completion date to Inuvik is now about 1986.

In such a case, the service unit at Fort Good Hope would not be required until about 1983. On the other hand the demand from leisure and business travellers arriving by air will continue to increase and accommodation and food facilities will be urgently needed before then. Also it can be assumed that any services started before then would have a definite competitive advantage when the highway did arrive and would cut into the projected business volume. For these reasons we recommend that the suggested organization be set up as soon as possible.

9.2 Action Program

(a) Discuss and approve or modify the prefeasibility study.

(b) Continue the discussions with the communities and get their reaction to the concepts proposed.

(c) Concurrently, discuss the proposals with potential Investor/Operators.

(d) Obtain commitments for financial support from the Indian Economic Development Fund and/or the Territorial Government.

When the broad concepts have been refined and accepted by all parties, specific implementation could begin.

(a) Select the private Investor/Operator.

(b) Select an appropriate combination of government and native participation in the Holding Company.

(c) Incorporate "Mackenzie Valley Motels Ltd."

(d) Make a final decision on location, design , size and timing of the facilities.

(e) Select and begin the training of the local Operators

(f) Begin construction.

APPENDICES

APPENDIX I

PROJECTED TRAFFIC VOLUME (1980)

HIGHWAY TOURISTS (1980)

1. INA Roadside Program

Total Vehicles	19,500	vehicles
Tourists (40%)	7,800	vehicles
North of Simpson (40%)	3,100	vehicles
Bednights (15% in hotels x 3 person/car x 4 nights)	5,600	bednights
Gasoline Consumption (190 mi/day x 4 days / 10 mpg)	240,000	gallons

2. Acres

Total Highway Tourist Parties	11,500	parties
North of Simpson (40 x 60%)	4,600-6,900	parties
Bednights (7% in hotels x 4 nights)	1,290-1,930	party-nights
Bednights (2.5 persons/party)	3,200-4,800	bednights

3. NWT/RMC

North of Simpson (20%)	10,000	tourists
Bednights (4-7 days x 15%)	6,000-10,500	bednights

4. Travacon (Simpson-Tuktoyaktuk)

Tourist Vehicles NWT	19,000	vehicles
North of Simpson (50% maximum)	9,500	vehicles
Bednights (2.6/car x 6 nights x 15%)	22,200	bednights
Gasoline Consumption (1500 mi/10 mpg)	1,425,000	gallons

TRUCKS (1980)

1. INA Roadside Program

Total Vehicles	19,500	vehicles
Trucks (25%)	4,900	trucks
North of Simpson (40%)	2,000	trucks
Bednights (100% in hotels x 2 persons x 2 nights)	7,800	bednights
Fuel Consumption (190 mi/day x 2 days / 4 mpg)	185,000	gallons
Peak Days Requirement (July 17% x 2.5)	2,500	gallons

TRUCKS (1980) cont....

2. Travacon

Ton Miles on Mackenzie Highway	95 million	ton miles
Truck (1,300 mi/20tons/truck)	3,500	trucks
Low to High Forecast	1,500-8,000	trucks
Fuel Consumption (400 mi/4 mpg)	350,000	gallons
Low to High	150,000-800,000	gallons

3. Stanley

Community Supplies	165,000	tons
North of Simpson (44%)	72,000	tons
Oil & Gas Exploration Supplies	556,000	tons
North of Simpson (63%)	351,000	tons
Total North of Simpson	423,000	tons
By Highway (14%-46%)	59,000-195,000	tons
Trucks (20 tons/truck)	3,000-9,700	trucks

AIR TOURISTS (1980)

People on package tours or travelling independently who arrive in the NWT by air, exclusive of lodges and outfitters)

1. Acres

Total Air Tourists	15,000-27,500	persons
North of Simpson (30%)	4,500-8,250	persons
Bednights (1.5 nights)	6,800-12,400	bednights

RESIDENT TRAVELLERS (1980)

1. INA Roadside Program (resident tourists)

Total Vehicles	19,500	vehicles
Residents (27%)	5,300	vehicles
North of Simpson (40%)	2,100	vehicles
Bednights (1.5 persons/car x 0%)		
Vehicle Miles (190 mi x 4 days)	1,600,000	vehicle miles
Gasoline Consumption at 10 mpg	160,000	gallons

RESIDENT TRAVELLERS (1980) cont....

2. Travacon (travel by local residents)

Fort Good Hope	50,000	vehicle miles
Fort Norman	67,500	vehicle miles
Wrigley	73,500	vehicle miles
Norman Wells	830,500	vehicle miles
	1,021,500	vehicle miles
Gasoline Consumption @ 10 mpg	102,000	gallons
TOTAL	262,000	gallons

BUSINESS AND GOVERNMENT

1. NWT

1973 Available Bednights all NWT	650,000	bednights
Actual Bednights (45% capacity)	290,000	bednights
Business & Government Bednights (89.5%)	260,000	bednights
1980 Business & Government (7%/year growth)	420,000	bednights
Assume Proportional to Population Business and Government between Simpson and Inuvik (1300/40,000 = $3\frac{1}{4}$%)	13,650	bednights

APPENDIX II

PROJECTED DEMAND FOR SERVICES (1980)

		Low	Mean	High	
MOTEL ACCOMMODATION					
1.	Highway Tourists	9,300	14,000	24,700	persons
	in Hotels*	7%	12.3%	15%	
	Length of Stay	4	4.9	7	days
	Total Bednights	2,600	8,400	26,000	bednights
2.	Truckers	1,500	4,400	9,700	trucks
	2 Nights Each x 2 Persons Truck**	6,000	17,600	38,800	bednights
3.	Air Tourists	4,500	6,400	8,250	persons
	1.5 nights each ***	6,800	9,600	12,400	bednights
4.	Residents				
	assume 0% stay in motels				
5.	Business and Government	3,100	6,200	9,300	persons
	2.2 Nights Each ****	6,800	13,700	20,600	bednights
	TOTAL	22,200	49,300	98,800	bednights
	Adjusted Projections	Low	35,000		bednights
		Mean	50,000		bednights
		High	75,000		bednights

* INA, Acres, N.W.T, Travacon
** INA
*** Acres
**** N.W.T/RMC

	Low	Mean	High	
GASOLINE				
1. Highway Tourists				
total tourists	9,300	14,000	24,700	persons
persons per car*	3.0	2.9	2.6	persons
total vehicles	3,100	4,828	9,500	vehicles
miles per trip**	760	880	1,000	miles
fuel consumption (10 mpg)	236,000	425,000	950,000	gallons
2. Residents				
fuel				
fuel consumption **	210,000	262,000	328,000	gallons
TOTAL	446,000	687,000	1,278,000	gallons
Adjusted Projections	Low	500,000		gallons
	Mean	700,000		gallons
	High	1,100,000		gallons
DIESEL FUEL				
1. Truckers				
total trucks	1,500	4,400	9,700	trucks
miles per trip***	760	880	1,000	miles
fuel consumption (4 mpg)	285,000	968,000	2,425,000	gallons
Adjusted Projections	Low	300,000		gallons
	Mean	950,000		gallons
	High	2,400,000		gallons

* INA, Acres, Travacon
** INA, Travacon
*** NWT/RMC

RESTAURANT		Low	Mean	High	
1.	Motel Users				
	Total Bednights	35,000	50,000	75,000	bednights
	Total Meals (3 per day)	105,000	150,000	225,000	meals
2.	Camping Tourists				
	Total Highway Tourists	9,300	14,000	24,700	persons
	Campers (82.5%)	7,670	11,500	20,380	persons
	Restaurant Meals per Trip*	1.5	3.0	5.0	meals
	Total Meals	11,500	34,650	101,900	meals
3.	Residents				
	Meals per Resident*	5	10	15	meals
	Total Meals (1300)	6,500	13,000	19,500	meals
	TOTAL	123,000	197,650	346,400	

Adjusted Projections	Low	130,000	meals
	Mean	200,000	meals
	High	300,000	meals

* NWT/RMC

SOURCES

* Forecast of Highway Users in the Northwest Territories, Preliminary Findings, Indian & Northern Affairs, June 1974.

* Study of the Tourism Potential for the Mackenzie Valley Communities, Acres Consulting Services Limited, May, 1973.

* Hotel Feasibility Study Fort McPherson, Laventhol, Krekstein, Horwath and Horwath, May, 1973.

* Establishing Service Stations on Indian Reserves, Indian and Northern Affairs, January, 1974.

* Edzo Commercial Centre Feasibility Study, Underwood McLellan and Associates Limited, October, 1973.

* Overview Study of Tourism and Outdoor Recreation in the Northwest Territories, W. M. Bake and Division of Tourism, March, 1973.

* The Travel Industry in the Northwest Territories 1973, Division of Tourism Government of the NWT, April, 1974.

* Economic Study of Transportation in the Mackenzie River Valley, Travacon Research Limited.

* Hay River Industrial Development Study - Transportation Projections for Hay River, Stanley Associates Engineering Ltd., March, 1974.

STUDY 4

AN ENTREPRENEURIAL OPPORTUNITY STUDY FOR SMALL BUSINESS PARTICIPATION IN THE OPERATIONS AND MAINTENANCE ACTIVITIES OF A MACKENZIE VALLEY PIPELINE

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1. INTRODUCTION

For the purpose of this study we have assumed that the gas pipeline construction phase would be completed by 1981, at which time natural gas would commence flowing from the far North southward. Although facilities such as compressor stations, metering stations, etc. would still be under construction, probably during the next five to seven years, pipeline operating and maintenance staff would be on duty.

The Applicant, in association with several other companies of the Consortium, is presently providing training in pipeline operations for between 70 to 90 northern residents. Although this potential staff is under no obligation to join the operating staff of the pipeline, it is expected that many will take positions with the Operating Company in the North once the pipeline is activated. This staff will be employed as administrative personnel, control technicians, skilled maintenance operators, station operators and measurement technicians.

The Applicant has stated that basic on-going operations would be undertaken by its own staff with some subcontracted services required, which could be performed by others. It is this second area of activity that could provide opportunities for local businessmen along the pipeline route.

There are several requirements and constraints that the Applicant identified affecting subcontract of contracted service activities. These are:

* *The subcontractor must be reliable;*

  The operating characteristics of the pipeline requires that services provided must be done within the time constraints established by operating and maintenance schedules.

* *The Applicant would provide significant on-site supervision during the early years of operation;*

  However, once the contractor has exhibited the skills and reliability necessary, supervision would probably be limited to short start-up and completion inspections.

* *Right-of-way work would generally be limited to winter months;*

  This would include any "mechanical" and "civil" engineering work that could be postponed to the freeze-up period. The Applicant does not wish to allow right-of-way maintenance operations during the summer months due to ecological reasons.

* *The Applicant would encourage the native people and northern residents to participate in contracted maintenance services;*

* *It is probable that contracted services would be more prevalent in those areas of high labour intensity.*

Once the pipeline is fully operational, the highly skilled contracted services i.e. pipeline construction related activities, would probably be limited to the Mackenzie Delta. A significant demand for pipeline construction related services is expected in this area due to the activity generated by exploration and gas field gathering line requirements.

2. SUMMARY

2.1 Pipeline Operations and Facilities

The Applicant, in the presentation of the probable pipeline operating characteristics, indicates that the pipeline will be managed and operated from three District Offices, Inuvik, Norman Wells and Fort Simpson, with a "Northern Division Office" located in Inuvik. The on-going operating phase of the pipeline should provide a number of opportunities for a Northern Contract Maintenance Organization to provide basic labour intensive maintenance services on the pipeline and its facilities. The basic pipeline facilities in the Northwest Territories are outlined in Table 1 and detailed in Exhibit I. The operating areas are shown in Exhibit II.

EXHIBIT 1

MACKENZIE VALLEY PIPELINE - MILES OF PIPELINE & RELATED FACILITIES

Centre	Pop. of (1) Centre	Miles of Pipe	Comp. Stn.	Meter Stn.	Co. D.O.	Block Valves	Brush Control Miles(2)	Airstrip	'Copter Pads	Comm. Towers	All Weather Road	Winter Snow Road	Winter Snow Trail	Wharfs
Inuvik	4,151	134	2	2	1	3	150.5	1@2400	8	6	1.5	11.5	5.0	1
Aklavik	761	71	1	-	-	2	60.5	1@2400	4	3	2.5	5.5	6.0	1
Ft. McPherson/	761	170	4	-	-	3	22.8	3@6000	8	8	12.0	36.0	22.0	2
Arctic Red River	122													
Ft. Good Hope	421	140	3	-	-	3	18.3	1@2400	7	7	4.0	24.0	19.0	3
Norman Wells	354	80	2	-	1	2	89.5	-	5	5	2.0	1.5	8.0	1
Fort Norman	282	111	2	-	-	3	123	1@2400	6	4	-	8.0	4.0	1
Fort Wrigley	213	131	3	-	-	2	137.5	1@2400	7	6	13.0	-	6.5	2
Fort Simpson	851	108	3	-	1	3	115.5	1@2400	7	6	21.5	1.0	6.5	-
Trout Lake	60	69	1	-	-	1	78	1@6000	2	2	-	-	9.0	-
		1,014	21	2	3	22	992	10	54	47	57.5	87.5	86.0	11

(1) Source: Northwest Territories, Community Data - 1974.

(2) Brush Control Miles - Includes Winter Snow Roads and Trails.

EXHIBIT 2

OPERATING AREAS
NORTHERN MAINTENANCE COMPANIES
NORTHWEST TERRITORIES

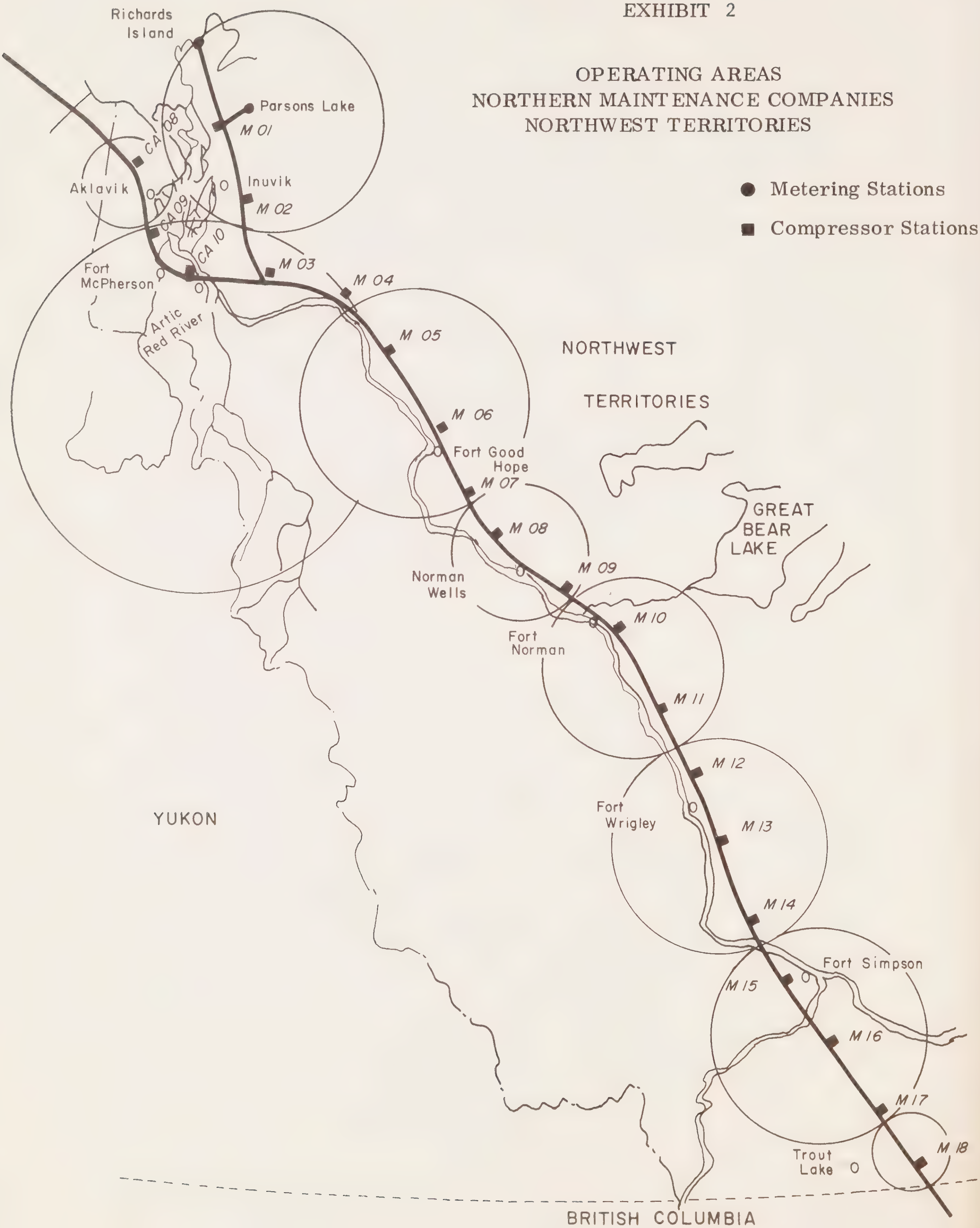


Table 1

Probable Pipeline Facilities - Operational Phase

Miles of Pipeline	1,014 miles
District Offices	3
Division Office	1 (at Inuvik)
Compressor Stations	21
Metering Stations	2
Airstrips	10
Communications Towers	47
Block Valves	22
Helicopter Pads	54
Wharfs	11
Borrow Pits	50 to 75
All-weather Roads	56 to 75 miles
Winter Snow Roads	80 to 100 miles

2.2 Contract Service Opportunities

There are several constraints to the provision of maintenance contract services that could be provided to an operating pipeline facility. These are:

* the general inaccessibility of the pipeline facilities;
* lack of technical and managerial skills in the North;
* lack of local capital;
* degree of entrepreneurial leadership on the part of the northern population;
* the need for a high level of contract performance and reliability in meeting operating schedules;
* the adverse affect on operations that could result from existing climatic conditions;
* the low numbers of people in certain areas along the pipeline route and the distances between these centres;
* the indeterminate nature of the requirements of the pipeline operation and maintenance;
* the probable need to limit contract maintenances to labour intensive operations.

Keeping in mind the above mentioned constraints, there are several areas where contract maintenance could be provided. These are:

(a) *General Maintenance - Compressor Stations, Metering Stations and District Offices*

* painting;
* weed control;
* carpentry;
* ground surfacing, etc.

(b) *Airstrips and Road Maintenance*

* snow removal;
* resurfacing and grading;
* brush and weed control.

(c) *Communications Tower Maintenance*

* painting;
* weed and brush control.

(d) *Helicopter Pad Maintenance*

* resurfacing and grading;
* brush and weed control;
* snow removal.

(e) *Gravel Stock Piling and Winter Road Construction*

* construction;
* gravel hauling;
* road right-of-way maintenance.

(f) *Brush Control*

* right-of-way brush slashing for pipeline and snow roads and trails.

(g) *Janitorial and Housekeeping*

* District Offices;
* Compressor Stations: security, cleaning and kitchen services.

It is estimated that contract services could provide a rather significant revenue for a "Northwest Territories Maintenance Operations". This forecasted revenue is summarized in Table and detailed in Exhibit III.

EXHIBIT 3

ESTIMATED ANNUAL REVENUES - MAINTENANCE AREAS

	Inuvik	Aklavik	Ft. McPherson Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake[1]
Compressor Station	$ 32,000	$ 8,000	$ 32,000	$ 24,000	$ 16,000	$ 16,000	$ 24,000	$ 32,000	$ -
Airstrip Maintenance	5,000	5,000	24,000	5,000	-	5,000	5,000	13,000	-
Road Maintenance	5,250	8,750	42,000	14,000	7,000	-	45,500	75,250	-
Communication Tower	3,200	1,600	6,400	4,800	3,200	3,200	4,800	6,400	-
Helicopter Pads	19,200	9,600	19,200	16,800	12,000	14,400	16,800	21,600	-
Gravel Stock Piles	24,000	6,000	24,000	18,000	12,000	12,000	18,000	24,000	-
Brush Control	90,300	36,300	136,800	109,800	107,400	147,600	165,000	138,600	93,600
Janitorial & Housekeeping									
- Office	24,000	-	-	-	24,000	-	-	24,000	-
- Compressor Stn.	48,000	24,000	96,000	72,000	48,000	48,000	72,000	96,000	-
- Kitchen Services	48,000	16,000	64,000	48,000	32,000	32,000	48,000	64,000	-
	$298,950	$115,250	$444,400	$312,400	$261,600	$278,200	$399,100	$494,850	$ 93,600

[1]With the exception of Brush Control, all items on the Trout Lake Section to be maintained by Fort Simpson staff due to Trout Lake's low population and work force skill and work force availability.

Table 2

Estimated Value of Contract Maintenance
Northwest Territories Pipeline Operations

	$
General Maintenance - Compressor Stations Metering Stations and Offices	192,000
Airstrip and Road Maintenance	307,000
Communications Tower Maintenance	38,400
Helicopter Pad Maintenance	129,600
Gravel StockPiling and Road Maintenance	138,000
Brush Control (ex. winter snow roads and trails)	847,000
Janitorial and Housekeeping Services	840,000
	2,492,000

2.3 Operating Characteristics of Contract Maintenance Organizations

It is suggested that the contract maintenance operations be provided by several maintenance contracting organizations located in:

* Inuvik
* Aklavik
* Fort McPherson and Arctic Red River
* Fort Good Hope
* Norman Wells
* Fort Norman
* Fort Wrigley
* Fort Simpson
* Trout Lake

The pipeline facilities in each of these areas are shown in Exhibit I. The geographic area of operation is shown in Exhibit II and Exhibit III shows the estimated operating revenues for each area.

2.4 Manpower Requirements

The estimated manpower needed for each of the operating centres is shown in Exhibit IV.

EXHIBIT 4

OPERATING MANPOWER REQUIREMENTS
MAINTENANCE ORGANIZATIONS - ALL CENTERS

	Administration		Operations			
	General Manager	Clerical	Foremen	Mechanic	Full Time	Part Time
Inuvik	1	$\frac{1}{2}$	2	1	6	8
Aklavik	1	$\frac{1}{2}$	1	1	1	5
Fort McPherson and Arctic Red River	1	$\frac{1}{2}$	2	1	8	13
Fort Good Hope	1	$\frac{1}{2}$	2	1	5	10
Norman Wells	1	$\frac{1}{2}$	2	1	4	9
Fort Norman	1	$\frac{1}{2}$	2	1	4	10
Fort Wrigley	1	$\frac{1}{2}$	2	1	6	15
Fort Simpson	1	1	2	1	8	18
Trout Lake	-	-	1 (1)	-	-	7

(1) Part-Time: Trout Lake operations to be managed out of Fort Simpson.

The suggested salary and wage rates for staff are as follows:

* General Manager	$20,000 per year
* Clerical	10,000 per year
* Mechanical	14,000 per year
* Foreman	15,000 per year
* General Maintenance	12,000 per year
* Part-time:	
- Semi-skilled	$7.00 per hour
- Unskilled	$5.50 per hour

2.5 Equipment and Facilities

Equipment and facilities (land and buildings) are shown in Exhibit V. (Typical snow track vehicles are shown in Appendix I.)

It is suggested that, because of the inaccessible nature of some of the facilities, the Maintenance Companies would use the Pipeline Operator's equipment (at a suitable rental rate) to perform some of the required work.

2.6 Organizational Characteristics

In order to provide the necessary management and technical expertise required by each of the local Organizations it is suggested that the following Organization be established:

(a) *The Northern Maintenance Corporation*

This Company would be a Holding Company, providing all necessary management, technical and financial and senior supervisory requirements of the total Organization.

(b) *The Local Organization* (e.g. Fort Simpson Maintenance Ltd.)

Each local Company would be owned by the native people in each area. They would have a local Manager who would supervise the overall operation of the local Company. The two exceptions are Trout Lake, which would be managed by Fort Simpson, and Fort McPherson and Arctic Red River which would be a joint operation. The overall

EXHIBIT 5

CAPITAL EQUIPMENT AND FACILITIES - ALL CENTERS

	Inuvik	Aklavik	Ft.McPherson Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake
One Ton Pick-up/Crew									
Number	1	-	2	1	1	1	1	2	-
Cost	$ 7,000	-	$14,000	$ 7,000	$ 6,950	$ 6,950	$ 6,950	$13,800	-
Six Yard Dump Truck									
Number	1	-	1	1	1	1	1	1	-
Cost	$22,000	-	$22,000	$22,000	$22,000	$22,000	$22,000	$22,000	
Eight Man Snow Track									
Number	1	1	2	1	1	1	1	2	1
Cost	$22,500	$22,500	$45,000	$22,500	$22,400	$22,400	$22,300	$44,000	$22,500
Three Ton Snow Track with Box & Attach.									
Number	1	1	1	1	1	1	1	2	-
Cost	$34,000	$34,000	$34,000	$34,000	$33,300	$33,300	$33,200	$66,400	-
Office Equipment	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,500	$ 500
Shop/Garage Equip.	$ 8,000	$ 3,000	$10,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$12,000	$ 1,000
Land-Square Feet	15,000	10,000	15,000	15,000	15,000	15,000	15,000	20,000	5,000
-Cost	$ 8,000	$ 5,000	$ 6,000	$ 6,000	$ 6,000	$ 5,000	$ 5,000	$ 8,000	$ 2,000
Building-Est. Sq. Ft.	800	600	800	800	800	800	800	1,000	400
-Est. Cost/Sq. Ft.	$30.00	$40.00	$35.00	$30.00	$25.00	$25.00	$25.00	$20.00	$30.00
- Total Cost	$24,000	$24,000	$28,000	$24,000	$20,000	$20,000	$20,000	$20,000	$12,000

Holding Company organization would appear as shown in Exhibit VI.

2.7 Corporate Headquarters

Headquarters for the Northern Maintenance Corporation could be located at any centre along the route of the pipeline with preference given to the location of the Pipeline Operation Division and/or District Offices.

It is estimated that approximately 2,500 square feet of office space would be required and about 10,000 square feet in property. The cost of land could be $5,000 and the building cost at $87,500. The number of corporate staff and salary for each are shown in Table 3.

Table 3

Corporate Staffing and Costs

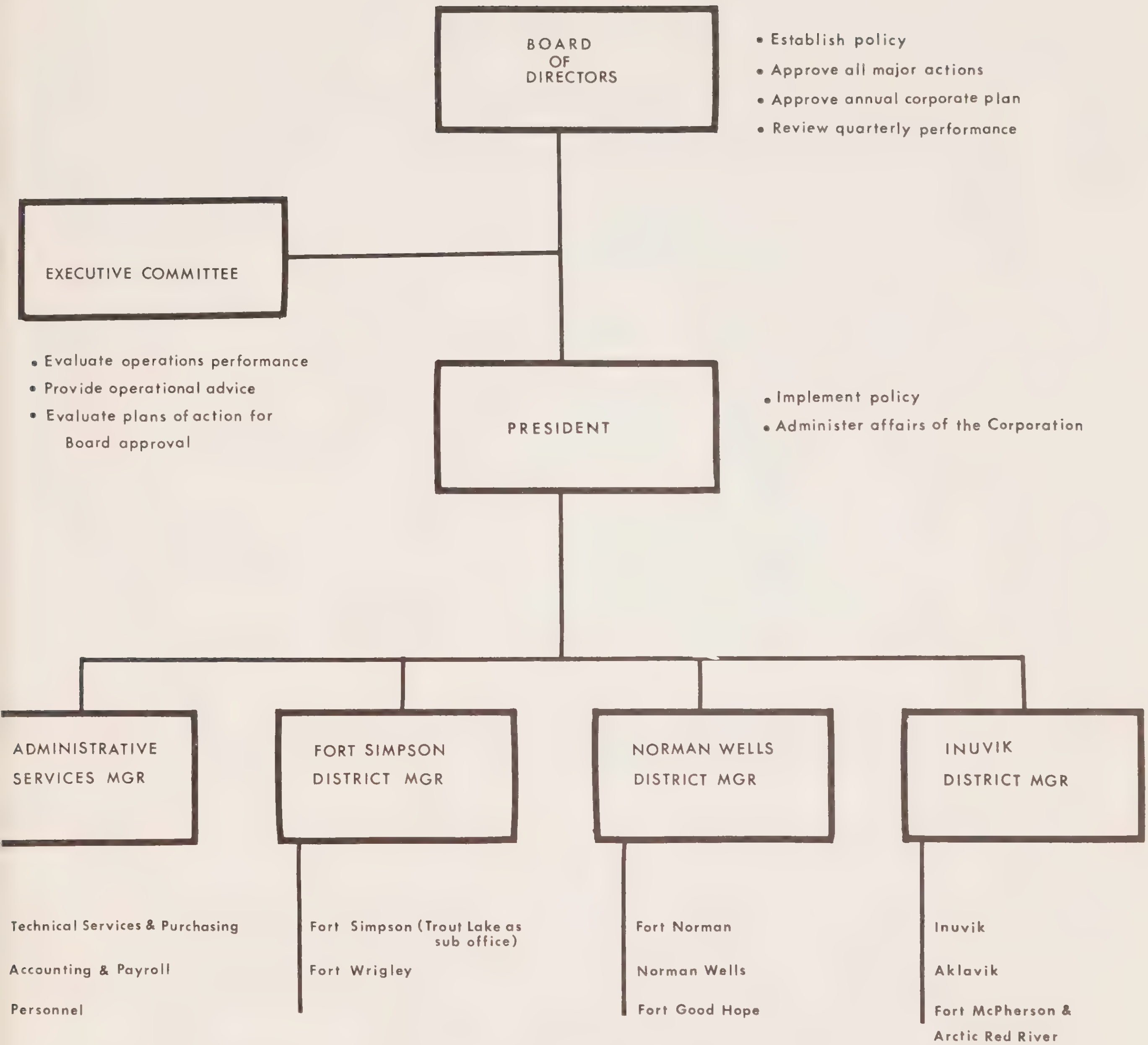
Position	Number	Total Cost Per Year[1]
		$
President	1	30,000
Administrative Services Manager	1	26,000
District Manager (3 @ $25,000)	3	75,000
Technical Services and Purchasing	1	22,000
Accountant	1	18,000
Secretarial Senior (1 @ $10,000)	1	10,000
Intermediate (2 @ $9,000)	2	18,000
Junior (1 @ $ 8,000)	1	8,000
Accounts Clerk (3 @ $10,000)	3	30,000
		237,000

[1]Excludes fringe benefits.

2.8 Financing and Corporate Ownership

It is suggested that the Applicant provide financing of the equipment required since the probable operational needs could be filled from excess equipment from pipeline construction operations. In addition, it is suggested that the Department of Indian and Northern Affairs provide the balance of investment capital through the Indian Economic Development Fund. Working capital

EXHIBIT 6



THE NORTHERN MAINTENANCE CORPORATION

requirements for the first year could be financed through the Band.

It may develop that local entrepreneurs may wish to participate in providing partial financing to a local Maintenance Company as an Investor/Manager if no suitable local managerial skills are available. This could be provided under a contractual arrangement permitting a "buy-back" of the Investor/Manager's equity at a future date once local skills are developed.

In summary, the following financing would be required:

* Transport and Work Equipment (new value - $765,350)
  - Source - Pipeline Applicant
  - Value - 30% of new value - $229,605
  - Terms - 9% per year - 5 years

* Other Equipment, Land and Building - $430,000
  - Source - I.N.A.
  - Value - $310,500—$120,000 Capital Grant
—$310,500 Loan
  - Terms - 9% per year - 10 years

The total capital requirements are $660,105. Approximately $103,000 line of credit would be established at the local banks for initial working capital requirements.

2.9 Financing Feasibility

All expenses and capital charges and repayments associated with the operation of the Holding Company, Northern Maintenance Corporation, would be assessed to each of the local Maintenance Companies on a revenue basis. It is estimated that the total charges, a year's operation, would be approximately $375,000. It is estimated that start-up costs to cover premaintenance contract performance, organizational needs and facility preparation would be $200,000.

The pro forma consolidated five year profit and loss statement is shown in Exhibit VII. The consolidated five year source and application of funds is shown in Exhibit VIII.

EXHIBIT 7

CONSOLIDATED PRO FORMA PROFIT & LOSS STATEMENT
ALL COMPANIES - NORTHERN MAINTENANCE CORPORATION
CONSTANT 1974 DOLLARS

	Year 1	Year 2	Year 3	Year 4	Year 5
Contract Revenue	$2,648,350	$2,648,350	$2,648,350	$2,648,350	$2,648,350
Operating Expenses					
Operating Staff	$1,195,300	$1,195,300	$1,195,300	$1,195,300	$1,195,300
Maintenance	112,000	112,000	112,000	112,000	112,000
	$1.307,300	$1,307,300	$1.307,300	$1.307,300	$1,307,300
Fringe Benefits	$ 117,657	$ 117,657	$ 117,657	$ 117,657	$ 117,657
Tools & Supplies	10,000	10,000	10,000	10,000	10,000
Fuel & Lubrication	20,000	20,000	20,000	20,000	20,000
Maintenance Expense	16,000	16,000	16,000	16,000	16,000
Air Charter	40,000	40,000	40,000	40,000	40,000
Equipment Rental	20,000	20,000	20,000	20,000	20,000
Dep. -Operating Equipment	45,921	76,737	101,389	121,112	116,889
-Maintenance Equip.	13,200	10,560	8,448	6,758	5,407
	$1,590,078	$1,618,254	$1,640,794	$1,658,827	$1,653,253
Operating Profit (Loss)	$1,058,272	$1,030,096	$1,007,556	$ 989,523	$ 995,097
Administration					
Salaries	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000
Fringe Benefits	18,450	18,450	18,450	18,450	18,450
Light, Heat, Power, Teleph.	30,000	30,000	30,000	30,000	30,000
Office Supplies	4,000	4,000	4,000	4,000	4,000
Travel and Expenses	30,000	30,000	30,000	30,000	30,000
Dep. - Land & Buildings	12,150	11,542	10,965	10,417	9,896
-Office Equipment	1,800	1,440	1,152	922	737
Insurance	10,000	10,000	10,000	10,000	10,000
Interest Expense	46,164	35,000	28,815	22,630	16,445
	$ 357,564	$ 345,432	$ 338,382	$ 331,419	$ 324.528
Start-up Costs	$ 200,000				
Corporate Admin. Exp.	$ 375,000	$ 375,000	$ 375,000	$ 375,000	$ 375,000
	$ 932,564	$ 720,432	$ 713,382	$ 706,419	$ 699,528
Gross Profit	$ 125,708	$ 309,664	$ 294,174	$ 283,104	$ 295,569
Taxes (1) (50%)	$ 62,854	$ 154,832	$ 147,087	$ 141,552	$ 147,784
Net Profit (Loss)	$ 62,854	$ 154,832	$ 147,087	$ 141,552	$ 147,785

(1) Taxes would probably be less if taxation calculated on an individual operating Company basis.

EXHIBIT 8

CONSOLIDATED PRO FORMA SOURCE AND APPLICATION OF FUNDS

	Year 1	Year 2	Year 3	Year 4	Year 5
Source of Funds					
Owner's Equity	$ 90,000	$ -	$ -	$ -	$ -
Debt: DIANA ($228,000 @ 9%)	228,000	-	-	-	-
Applicant ($229,605 @ 9%)	229,605	-	-	-	-
Bank ($ 41,500 @ 12%)	41,500	-	-	-	-
Decrease in Working Capital	-	13,610	-	-	-
Depreciation	73,071	100,279	121,954	139,209	132,929
Net Income	62,854	154,832	147,087	141,552	147,785
	$725,030	$268,721	$269,041	$280,761	$280,714
Application of Funds					
Additions-Building & Equip.	$547,605	$200,000	$200,000	$200,000	$100,000
Debt Repayment-DIANA	22,800	22,800	22,800	22,800	22,800
-Applicant	45,921	45,921	45,921	45,921	45,921
-Bank	41,500	-	-	-	-
Increase in Working Capital	67,204	-	320	12,040	111,993
	$725,030	$268,721	$269,041	$280,761	$280,714
Working Capital(exDepreciation)					
Working Capital Beginning Year	$ 41,500	$108,704	$ 95,094	$ 95,414	$107,454
Increase (Decrease) Cash	67,204	(13,610)	320	12,040	111,993
	$108,704	$ 95,094	$ 95,414	$107,454	$219,447
Working Capital Change	$ 67,204	$(13,610)	$ 320	$ 12,040	$111,993

2.10 Pipeline Company Participation

Although no provision is shown on the organization sheet for Company participation (Exhibit VI), it is suggested that the Pipeline Operator provide some input at the Executive Committee level. In addition, the operator should provide a Senior Staff Advisor at each of their District Offices to provide guidance to operating staff, training to maintenance employees and general technical assistance on performance.

2.11 Implementation

The implementation program outlined in section 10 of the report illustrates the preplanning which must be undertaken if such a program is to be successful. The goal of the program is to provide an opportunity for native people in the Northwest Territories to share in the economic opportunity provided by the construction and operation of a natural gas pipeline. The proposed venture should also establish opportunities to develop native skills, not only as equipment operators but as administrative and management personnel.

The generation of wages and salaries which would remain for the most part in the North, may eventually provide for entrepreneurial activity in other business endeavours to the benefit of local economies.

3. OPERATING AREA AND PROBABLE FACILITIES

3.1 Operating Divisions and Districts

The map of Exhibit IX shows the Operating and Maintenance Divisions and Districts for the proposed pipeline. The Northern Division, encompassing the pipeline and related facilities installed in the Northwest Territories, will have the Division Office located in Inuvik with District Offices in Inuvik, Norman Wells and in Fort Simpson.

Once the pipeline is fully operational, the majority of major development activity will be concentrated in the Inuvik District, primarily in the Mackenzie Delta where gas and oil exploration should accelerate. This

EXHIBIT 9

Fig. 2.1.1A 13.b

exploration activity would result in the construction of field gathering lines, field trunk lines and related metering (measuring) stations. Without doubt, the oil and gas industry infrastructure that now exists in the Delta, will grow to keep pace with exploration activity. This infrastructure, which embraces those services of transport, mechanics, electric, electronics, hydraulics, pneumatics and construction, should generate the demand for a continuing and highly skilled industrial sector.

The Pipeline Operating Company, hereafter referred to as the "Company", would be concerned primarily with the operations of the pipeline facility. Any trunk gathering lines and their facilities would be constructed under contract in a similar procedure to that followed for the main pipeline and its facilities.

The Company's estimate of the staff required for operations, as outlined in their submission (Section 13.b), is shown in Exhibit X. This estimate is based on the Company possessing a sufficient number of its own people to provide the technical and administrative personnel to operate and maintain the pipeline. It was recognized that some of the general labour intensive work would be performed by subcontractors on a local basis.

It is highly unlikely that, during the early years of operation, a technical service infrastructure would be available along the route of the pipeline to provide repair and maintenance services for electrical, electronic, pneumatic, mechanical and hydraulic equipment and controls. The possible exception to this could be in the Delta, where such service facilities could develop faster due to oil and gas exploration activity. It is also evident that operating experience is also necessary to establish what technical service will be required both "in-house" and from outside firms.

The Company also plans to schedule regular and frequent visits by its staff to the facilities located on the pipeline (meter stations, block valves, compressor station, etc.), particularly during the early years of operation. As many of these facilities are at remote locations, this staff would be "flown-in" for periods of time ranging from brief inspection trips to longer work trips. In all probability staff will be on hand at compressor stations during the early years on a continuous basis, even though these stations are designed for remote control operation on an unmanned station basis.

EXHIBIT 10

NORTHERN DIVISION HEADQUARTERS — INUVIK, N.W.T.	TOTALS FOR YEARS 1	2	3	4	5
Division Manager	1	1	1	1	1
Administration, Personnel, Public Relations, Safety & Training	2	2	2	2	2
Engineering, Technical, Environmental, Lands & Right-of-Way	2	2	2	2	2
Clerical	4	4	4	4	4
	9	9	9	9	9

	INUVIK DISTRICT (200 miles of pipe-1st Yr.) (496 miles of pipe-2nd Yr.)					NORMAN WELLS DISTRICT (308 miles of pipe)					FORT SIMPSON DISTRICT (310 miles of pipe)					TOTALS FOR YEARS				
	Years of Operation					Years of Operation					Years of Operation									
Personnel	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
District Superintendent	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3
District Engineer	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3
Pilot	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4
Flight Engineer	2	2	2	2	2	1	1	1	1	1	1	1	1	1	1	4	4	4	4	4
Clerical	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	12	12	12	12	12
Maintenance Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3
Foreman	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1	3	4	4	4	4
Mechanic	2	4	4	4	4	2	4	4	4	4	3	4	4	4	4	7	12	12	12	12
Operator	3	6	6	6	6	2	4	4	4	4	3	4	4	4	4	8	14	14	14	14
Welder	2	3	3	3	3	2	3	3	3	3	3	3	3	3	3	7	9	9	9	9
Maintenance Man	8	12	12	12	12	6	8	8	8	8	8	8	8	8	8	22	28	28	28	28
Chief Technician	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	3
Technician	17	29	32	31	31	14	29	32	36	36	11	23	29	33	33	42	81	93	100	100
Total Personnel	45	68	71	70	70	37	59	62	66	66	39	53	59	63	63	130	189	201	208	208
Stations in Operation	1	3	4	4	4	2	4	5	7	7	1	3	5	7	7	4	10	14	18	18

FIVE-YEAR PERSONNEL REQUIREMENTS
FOR THE NORTHERN DIVISION,
INUVIK DISTRICT, NORMAN WELLS DISTRICT AND FORT SIMPSON DISTRICT

TABLE 2.1.2D

13.b

Right-of-way patrol would in all probability be done from the air, with the Company's District Superintendent being flown-in using Company air transport on a periodic basis. The frequency of this patrol is not specifically determined, as only actual experience will dictate the intervals. It is also anticipated that "line walking" if, when, and where required would be done by Company personnel at least during the initial years of operation. It has also been stated that no heavy equipment will be allowed on the right-of-way during the summer months unless it be absolutely necessary for maintenance of pipeline operations. This is deemed necessary to minimize any damage to the terrain by the mobile equipment. All ground transport along the right-of-way would be permitted only during the winter months and only when necessary.

Because of the remoteness of the facilities, the Company plans to have specific types of transportation and work equipment available at various specific locations along the pipeline. Exhibit XI shows the Company's preliminary estimate of the types and quantities of this equipment by location. It is also expected that Company maintenance mechanics would check the running condition of this equipment during their frequent visits to the compressor and metering station locations.

3.2 Probable Pipeline Facilities

Along the 1,014 miles of pipeline within the Northwest Territories a number of facilities will be required as part of direct pipeline operation and as support facilities for the pipeline. A list of these facilities taken from the Company's submission is shown in Table 4.

3.2.1 District Offices and Maintenance Centres

There are three locations which will act as Pipeline Operations and Maintenace Centres for specific sections of the pipeline. The Inuvik Office will have responsibility for the operating and maintenance of 396 miles of pipeline and related facilities; the Norman Wells Office for 308 miles of pipeline and facilities, and the Fort Simpson Office for 310 miles of pipeline and facilities.

EXHIBIT 11(a)

LOCATION/STATION	YUKON		MP 329				NORTHWEST TERRITORIES					
	CA-05	CA-06	CA-07	CA-08	CA-09	CA-10	Meas. Stn.	M-01	Inuvik	M-03	M-04	District Total
Milepost:	222	269	313	361	407	453	00	41	85	126	171	
PERSONNEL CARRIERS:												
Various Types	11	8	8	8	11	8	2	4	24	4	1	89
HEAVY EQUIPMENT:												
Backhoe 1½ c.y.	1				1				1			3
Sideboom	2	2	2	2	2	2	2	1	2	2		19
Dozer	1	1	1	1	1	1	1	1	2	1	1	12
Snow Sled	1	1	1	1	1	1		1	2	1		10
Tandem Tractor Truck									1			1
Highboy Trailer									1			1
Lowboy Trailer									1			1
Propane Trailer									1			1
LGP Vehicle 10 Ton	1	1	1	1	1	1	1	1	1	1		10
LGP Vehicle 40 Ton	1	1	1	1	1	1	1	1	1	1		10
LGP Vehicle Backhoe & Blade	1	1	1	1	1	1	1	1	1	1		10
LGP Trailer	2	2	2	2	2	2	1	1	2	1		17
WORK EQUIPMENT:												
Truck 5 Ton w/Hydr. Crane	1				1				1	1		4
Trucks, various special purpose	1				1				4			6
Grader & Snowplow	1	1	1	1	1	1		1	1	1	1	10
LGP Crane 20 Ton	1				1		1		1			4
Tractor Backhoe Loader	1	1	1	1	1	1	1	1	1	1		10
SPECIAL EQUIPMENT:												
Air Cushion Vehicle									1			1

SUMMARY OF MAJOR ITEMS OF GROUND TRANSPORTATION AND WORK EQUIPMENT FOR INUVIK DISTRICT

TABLE 3.1.1A

13.b

LPG: Low Ground Pressure Vehicles

EXHIBIT 11(b)

LOCATION/STATION	M-05	M-06	M-07	Norman Wells	M-10	M-11	District Total
Milepost:	220	263	310	375	446	490	
PERSONNEL CARRIERS:							
Various Types	1	2	2	12	2	5	24
HEAVY EQUIPMENT:							
Backhoe 1½ c.y.				1			1
Sideboom		2		2		2	6
Dozer	1	1		2		1	5
Snow Sled		1		1	1		3
Tandem Tractor Truck				2			2
Highboy Trailer				1			1
Lowboy Trailer				2			2
Propane Trailer				1			1
LGP Vehicle 10 Ton		1		1		1	3
LGP Vehicle 40 Ton		1		1		1	3
LGP Vehicle Backhoe & Blade		1	1	1	1	1	5
LGP Trailer		1		1		1	3
WORK EQUIPMENT:							
Truck 5 Ton w/Hydr. Crane			1			1	2
Trucks, various special purpose			1	4		1	6
Grader & Snowplow	1	1	1	1	1	1	6
LGP Crane 20 Ton				1			1
Tractor Backhoe Loader	1	1	1	1	1	1	6

SUMMARY OF MAJOR ITEMS OF GROUND TRANSPORTATION AND WORK EQUIPMENT FOR NORMAN WELLS DISTRICT

TABLE 3.1.1B

13.b

EXHIBIT 11(c)

LOCATION/STATION	M-12	M-13	M-14	Fort Simpson	M-16	M-17	M-18	District Total
Milepost:	534	582	619	710	716	751	808	
PERSONNEL CARRIERS:								
Various Types	1	2	1	9	1	6	1	21
HEAVY EQUIPMENT:								
Backhoe 1½ c.y.				1				1
Sideboom		2		2		2	1	7
Dozer		1	1	2	1	1		6
Snow Sled		1		1		1		3
Tandem Tractor Truck				2				2
Highboy Trailer				1				1
Lowboy Trailer				2				2
Propane Trailer				1				1
LGP Vehicle 10 Ton	1	1		1		1	1	5
LGP Vehicle 40 Ton		1		1		1		3
LGP Vehicle Backhoe & Blade		1		1		1		3
LGP Trailer	1	1		1		1	1	5
WORK EQUIPMENT:								
Truck 5 Ton w/Hydr. Crane				1				1
Trucks, various special purpose				4				4
Grader & Snowplow	1	1		1		1	1	5
LGP Crane 20 Ton				1	1			2
Tractor Backhoe Loader	1	1		1		1	1	5

SUMMARY OF MAJOR ITEMS OF GROUND TRANSPORTATION AND WORK EQUIPMENT FOR FORT SIMPSON DISTRICT

TABLE 3.1.1C

13.b

Each District Office would have approximately 10,000 to 15,000 square feet of building structure excluding garage sheds, etc. There would be facilities for all technical maintenance operations, transport maintenance offices, classrooms and stores.

Table 4

Probable Facilities on the Pipeline at Full Operational Status

District Offices and Maintenance Centres (including Division Office at Inuvik)	3
Compressor Stations	21
Metering Stations	2
Airstrips	10
Communication Towers	47
Block Valves	22
Helicopter Pads	54
Wharfs	11
Borrow Pits	50 to 70
All-weather Roads	56 to 75 miles
Winter Snow Roads	80 to 100 miles
Winter Snow Trails (communication towers to borrow pits and access)	80 to 100 miles

3.2.2 Compressor Stations

At full operation, there is planned to be 21 compressor stations of the remote control unmanned type. These stations would have all the necessary bulk petroleum products storage facilities; sewage and waste treatment and water conditioning equipment; airstrips; and transport and work equipment, along with spare parts and stores inventory. Each station would also have living quarters and food stocks on hand for use by maintenance personnel during their visits. A stockpile of sand and gravel would also be maintained at each station for airstrip, road and station area maintenance. The complete plant area would be fenced.

3.2.3 Metering Stations

Two metering stations are planned at this time, one at Richards Island, the other at Parson's Lake. The

support facilities would be similar to that of the compressor stations.

3.2.4 Airstrips

There are ten airstrips planned, to be located at the compressor stations. Four of these airstrips will have 6,000 foot runways with the balance (six) at 2,400 feet each. The airstrips must be maintained serviceable for a full year operation.

3.2.5 Communication Towers

Forty-seven communications towers ranging in height from 60 feet to 300 feet are being planned. Twenty-one of these towers are in remote locations with the remaining 26 located at District Offices and compressor and metering stations. Each of the remote stations will have access by helicopter.

3.2.6 Block Valves

These facilities, which are located between compressor stations at approximately 20 miles distance from stations will have access by helicopter. Each of the 22 block valves will be fenced.

3.2.7 Helicopter Pads

There will be approximately 54 helicopter pads located at the communication towers, District Offices, compressor stations (without airstrip), block valves and metering stations. These facilities must be maintained for year-round service.

3.2.8 Wharfs

Eleven river wharfs are planned to provide access for delivery of goods and equipment to certain compressor stations. These wharfs must be serviceable during the summer shipping season.

3.2.9 Borrow Pits

An estimated 50 to 60 borrow pit locations are required to provide road and gravel services for all facilities requiring ground area cover, i.e. helicopter pads, compressor stations, metering stations and roads. Access to these borrow pits would normally be during the winter months unless all-weather roads were available.

3.2.10 All-weather Roads

A minimum of 56 miles of all-weather roads are planned for access to compressor stations from wharfs, main highways and airstrips. This figure could increase markedly when the Mackenzie Highway is completed. These roads would be required to be serviceable all year round.

3.2.11 Winter Snow Roads

Between 80 to 90 miles of winter snow roads are required to provide access to borrow pits and compressor stations. These roads would be built during construction and be reinstated in winter for access for sand and gravel stocks replenishment at compressor stations.

3.2.12 Winter Snow Trails

These winter snow trails provide ground access to remote facilities such as communication towers, small borrow pits and block valves. There will be approximately 80 to 90 miles of these winter trails.

4. OVERALL CONTRACT SERVICE OPPORTUNITIES

There are a number of contracted services that could be provided to the Company. There are, however, several things that affect the amount of participation by the native people and the northern residents. These are:

* the general inaccessibility of the pipeline facilities;
* the lack of properly trained people with the managerial and technical skills required;

* the lack of capital on a local basis to finance the high cost of northern operations;
* degree of entrepreneurial leadership available particularly among the native people;
* the demand for a high degree of reliability in performing pipeline related maintenance operations;
* the climatic conditions that affect the scheduling of pipeline maintenance operations;
* the low population and the distance between population centres to the pipeline could preclude the active participation of some centres in contract maintenance operations;
* several years of operation may be required to prove out and establish contract maintenance requirements of the Company due to the evolutionary development of maintenance requirements;
* contract maintenance would probably be limited to a labour intensive type of operation.

On the basis of probable pipeline requirements for contract maintenance, the following opportunities on a total basis may be available for northern participation. All cost and price estimates are in constant 1974 dollars.

4.1 General Maintenance - Compressor Stations and Metering Stations

There will be a requirement to paint station facilities, repair buildings, repair and resurface station pads (sand and gravel), brush and weed control and other general maintenance at all the stations on a periodic basis. It is estimated that approximately 20 man weeks of work would be required at each station once every two years.

At an hourly cost of $20.00 per hour, which would include all administrative and overhead expenses as well as labour, the contract for each facility would be approximately $16,000 per year. With two metering stations and 21 compressor stations, the total annual contract would be $192,000 (12 locations each year on a two year rotation).

4.2 Airstrip and Road Maintenance - Summer Maintenance Period

With ten airstrips and an estimated 70 miles of all-weather road, (additional mileage estimated for direct access once the Mackenzie Highway is opened), a contract for surface maintenance could be as follows (gravel surfacing, grading, snow plowing and brush and drainage control):

* *Road Maintenance* (based on annual charge of $3,500 per mile)

- 70 miles of road		$245,000

* *Airstrip Maintenance* (based on annual charge of $5,000 per 2,400 foot strip and $8,000 per 6,000 foot strip)

- 10 Airstrips		
- 4 @ 6,000' @ $8,000	$32,000	
- 6 @ 2,400' @ $5,000	30,000	$ 62,000

4.3 Communication Tower Maintenance - Year-Round Maintenance Period

Mechanical maintenance (equipment) would be provided by the Company. However, the towers would require painting at a probable two year interval. It is estimated that approximately two man weeks would be required to paint each tower. With 47 towers and a labour cost of $20.00 per hour, the total annual contract for all towers would be approximately $38,400; assuming 24 towers were painted each year at a cost of $1,600 per tower.

4.4 Helicopter Maintenance Pad - Summer Maintenance Period

Helicopter pad maintenance would normally be performed each time that the Company staff visited the sites during periodic routine maintenance. However, if the maintenance logistics required six visits per year by subcontract staff to grade and surface the pads and provide gravel stock piles from borrow pits on a continuing basis, the annual cost per "pad" would be estimated at $2,400 based on a pad maintenance visit by two men for two days to perform the necessary gravel haulage and pad surfacing and grading. The total annual contract for all 54 helicopter pads is thus estimated at $29,600.

In this operation, tracked equipment would be required for winter haul of gravel from borrow pits to point of use. Maintenance period is assumed to be during the summer months.

4.5 Gravel Stock Piling and Winter Road Construction

As access to most borrow pits will be by winter road, gravel stock piling operations at the compressor stations (for station site and airstrip maintenance) would be conducted coincident with the re-opening, on a short term basis, of winter roads to borrow pit sites. It is extremely difficult to estimate annual gravel requirements as only experience will dictate the need. However, if it is assumed that 500 yards of gravel is required on an annual basis for each compressor-metering station site for road, pad and airstrip maintenance, at an assumed price of $12.00* per cubic yard (normal pit operation at $3.50 to $4.50), the total cost of the 21 compressor stations could be $138,000 per annum.

4.6 Brush Control - Pipeline Right-of-way and Winter Snow Roads and Trails

It is estimated that the route of the pipeline from Richards Island to the 60th parallel, and a section of the Prudhoe Bay line from the Mackenzie Valley Junction for 150 miles west will require periodic brush control, i.e. slashing of brush and trees to permit continuous access if required. The Company also estimates that the section north from Norman Wells will have to be slashed at least once every 10 to 15 years; and the section south from Norman Wells at least once every five years.

The nature of the terrain could dictate the method used, i.e. either motorized mowing or hand slashing. Because of the summer restriction on motorized equipment on the right-of-way, it is more likely that the hand slashing method of brush control would be used.

It is estimated that, with hand slashing, ten man weeks would be required to slash one mile of right-of-way. At a contract rate of $15.00 per hour, one mile of

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*We have used a high figure to reflect the intermittent nature of the operation and the special equipment required for the job such as dump body equipped tracked vehicles.

slashing would cost $6,000. If it were assumed that 410 miles were to be slashed on a five year cycle and 573 miles to be slashed on a 10 year cycle then the total estimated annual slashing contract would be $847,000.

4.7 Janitorial and Housekeeping Services - Summer Maintenance Period

Although the compressor stations are designed for unmanned operation, there is some evidence from the Company, and also from TransCanada PipeLines Limited, that there will be a need for on-site janitorial and watchman services at each of the stations. Evidently since the general maintenance staff will make frequent visits to the stations, the Company may find it prudent to provide janitorial and security services on-site. It is indicated that these services should be on a seven day, 24 hour basis with the probability of one to two people being required on a steady basis for each site.

It is also probable that kitchen (meal preparation) services will be required which may or may not be on a catering basis. If only kitchen staff is required, each station may require one cook and one assistant to be available when required.

In addition to the above, solid refuse disposal would be required, with all non-combustible material hauled to an approved site and with solid sanitary waste disposed of in the same manner. Again actual experience would probably establish the degree of need.

Janitorial and waste and refuse disposal will also be required at each of the District Offices. Janitorial service would require the services of one man week per District Office with the possible trucking of waste to approved disposal sites on a monthly or bi-weekly basis.

In summary then, the janitorial and housekeeping services may involve the staffing as outlined below:

* *District Offices* (3)
  - Janitorial Staff - 1 man per office @ $12 per hour. Estimated Total Annual Cost (price includes supplies) $72,000

* *Compressor Stations* (21)

  - Janitorial Security Staff - 2 man years/station @ $12 per hour Estimated Total Annual Cost for 10 plants (conservative estimate, price includes supplies) $480,000

  - Contract Kitchen Services Staff - 2 man year/station @ $12 per hour, assumed six station annual requirement Estimated Total Annual Cost (food not included) $288,000

Waste disposal at inaccessible stations would probably be provided by the janitorial employees using Company transport facilities. Waste disposal at District Offices would be on a contract basis with present local service organizations.

It would appear logical that janitorial and kitchen assistance could be provided by Company paid employees. However, it may be advantageous to subcontract these services to local organizations.

4.8 Other Services

There is no doubt that other services would be required over the long term period of pipeline operations. Transport and work equipment maintenance could be performed at the major centres and would probably be done so once the Mackenzie Highway is opened. However, no estimate is made of this requirement. It is felt that existing service organizations in the major localities would probably expand and be able to provide all the services required, assuming of course, that reliable performance is provided.

Skilled repair service for controls and other equipment may develop along the pipeline but this is doubtful. Since the Company will have to provide the skilled personnel initially, with most equipment having replacement modules for ease of maintenace and major maintenance on modules requiring return to the manufacturer, this type of service could not be planned for at this time. Over the long term however, certain well qualified personnel, trained by the Company, could recognize a business opportunity for this type of service.

4.9 Summary of Overall Contract Service Opportunities

In appraising the overall contract service opportunities, no constraints were placed on local Organizations to provide the extent of the services suggested. These contraints, the logistics of operations, and the probable extent of services provided along the pipeline will be discussed in the next section.

In summary then, the overall estimated annual opportunity for contract services would be as follows:

(a)	General Maintenance - Compressor Stations, Metering Stations and District Offices	$192,000
(b)	Airstrip and Road Maintenance	$307,000
(c)	Communication Tower Maintenance	$ 38,400
(d)	Helicopter Pad Maintenance	$129,600
(e)	Gravel Stock Piling and Winter Roads Construction	$138,000
(f)	Brush Control (pipeline only)	$847,000
(g)	Janitorial and Housekeeping Services:	
	- District Offices	$ 72,000
	- Compressor Stations	$480,000
	- Kitchen Services	$288,000
	TOTAL OVERALL VALUE OF CONTRACT SERVICES	$2,492,000

The above value of possible contract work is an estimate, based on value judgements as to the types of work that would be performed on a local basis. The data in this section do not include any constraints on contract operations and assume the ability to service the complete pipeline within the Northwest Territories at a level of service demanded by the pipeline Operating Company. The next section of this report analyzes the ability of local areas to provide contract service and the probable operating cost criteria.

5. OPERATING CHARACTERISTICS OF CONTRACT ORGANIZATIONS

With over 1,000 miles of pipeline and a number of related facilities to be maintained, the distances

involved, the climatic conditions and the difficulty of moving men and equipment in the North, it seems more realistic to assume an operational approach based on small multi-purpose maintenance contracting firms at various locations along the pipeline route.

For the purposes of this report the centres selected are outlined in Exhibit XII along with the pipeline facilities that will be within the operating area of each centre. The centres chosen for the establishment of subcontracting pipeline maintenance companies are:

* Inuvik
* Aklavik
* Fort McPherson and Arctic Red River
* Fort Good Hope
* Norman Wells
* Fort Norman
* Fort Wrigley
* Fort Simpson
* Trout Lake

The map in Exhibit XIII shows the general area of operation for each of the centres.

Since the pipeline will not become operational until 1981 or 1982, if construction starts in 1977, it is assumed that the Mackenzie Highway will be completed to meet the Dempster Highway before this date. This assumption simplifies the transportation logistics for certain areas where the highway and pipeline are relatively close together.

5.1 Inuvik: Outline of Operating Characteristics

Inuvik has the largest concentration of population along the route of the pipeline. In addition, because of the exploration activity for oil and gas in the Delta, the development of basic equipment operating skills on the part of the northern population will probably be more prevalent. Inuvik will also be the Headquarters for the Northern Division of the Pipeline Company.

5.1.1 Area of Maintenance Operations, Pipeline Facilities and Estimated Annual Revenue

The maintenance centre would be responsible for all pipeline facilities on the Parson's Lake pipeline and the pipeline from the Richards Island metering station to

mile 119 towards the Prudhoe Bay Junction. Table 5 shows the pipeline facilities in this area.

Table 5

Pipeline Facilities - Inuvik Section

Miles of Pipeline	134 miles
Compressor Stations	2
Meter Stations	2
Company Offices	1
Airstrips	1 @ 2,400 ft.
Helicopter Pads	8
Communications Towers	6
All-weather Roads	1.5 miles
Winter Snow Roads	11.5 miles
Winter Snow Trails	5,0 miles
Wharfs	1
Brush Control (includes snow roads and trails)	150.5 miles

On the basis of the preliminary analysis shown in section 4, the estimated revenue for the Maintenance Contracting Company sould be as shown in Table 6.

5.1.2 Operations Manpower

The manpower by man weeks as shown in Table 7 would be required for each year of operation under the revenue situation outlined in subsection 5.1.1.

On the basis of the analysis shown in Table 7, approximately eight full-time operating employees would be required, and eight part-time employees for summer operations would be needed.

Of the full-time employees, two would have heavy equipment operator skills, general transport driving ability and a broad maintenance experience. These individuals would also act as Foremen on all field maintenance operations undertaken by the "Maintenance Company". Four would require a general maintenance and janitorial skill with two having skills as cooks and housekeepers.

The part-time staff (summer months) would be made up of four general labourers and four individuals with experience in general maintenance skills, i.e. carpentry, masonry, etc. as well as small transport driving ability.

Table 6

Estimated Annual Revenue - Inuvik Section

Compressor and Metering Stations: 4 in total	
- two maintained per year	$ 32,000
Airstrip and Road Maintenance	
- airstrip (2,400 feet)	5,000
- road (1.5 miles)	5,250
Communication Towers: 6 in total	
- three painted per year	3,200
Helicopter Pads: 8 in total	19,200
Gravel Stock Pile and Winter Road Maintenance	
- 500 cubic yards each for 2 compressor stations and 2 metering stations	24,000
Brush Control: 134 miles pipeline, 11.5 miles of winter snow road and 5 miles of winter snow trails: total 150.5 miles	
- cycle: 10 years @ 15.05 miles per year	90,300
Janitorial and Housekeeping	
- District Office - 1	24,000
- compressor stations - 1 on average	48,000
- contracted kitched services - 1 on average	48,000
TOTAL ESTIMATED REVENUE	$298,950

Table 7

Man Weeks of Labour Required

	Summer Only 5 Months	Winter Only 5 Months	All Year 12 Months
Compressor and Metering Stations - Maintenance	20	-	-
Airstrip and Road Maintenance	-	-	15
Communication Towers	12	-	-
Helicopter Pads	-	-	16
Gravel Stock Pile	-	35	-
Brush Control	151	-	-
Janitorial and Housekeeping			
- District Office	-	-	52
- Compressor Stations	-	-	208
- Contracted Kitchen Service	-	-	104
	183	35	395
Allowance for Weather 10%	18	4	3
TOTAL LABOUR REQUIREMENT	201	39	398
Weeks Available Per Man Per Period	20	20	50
Manpower Required			
- Per Period	10	2	8
- Full-time		8	
- Part-time		8 (summer months)	

EXHIBIT 12

MACKENZIE VALLEY PIPELINE - MILES OF PIPELINE & RELATED FACILITIES

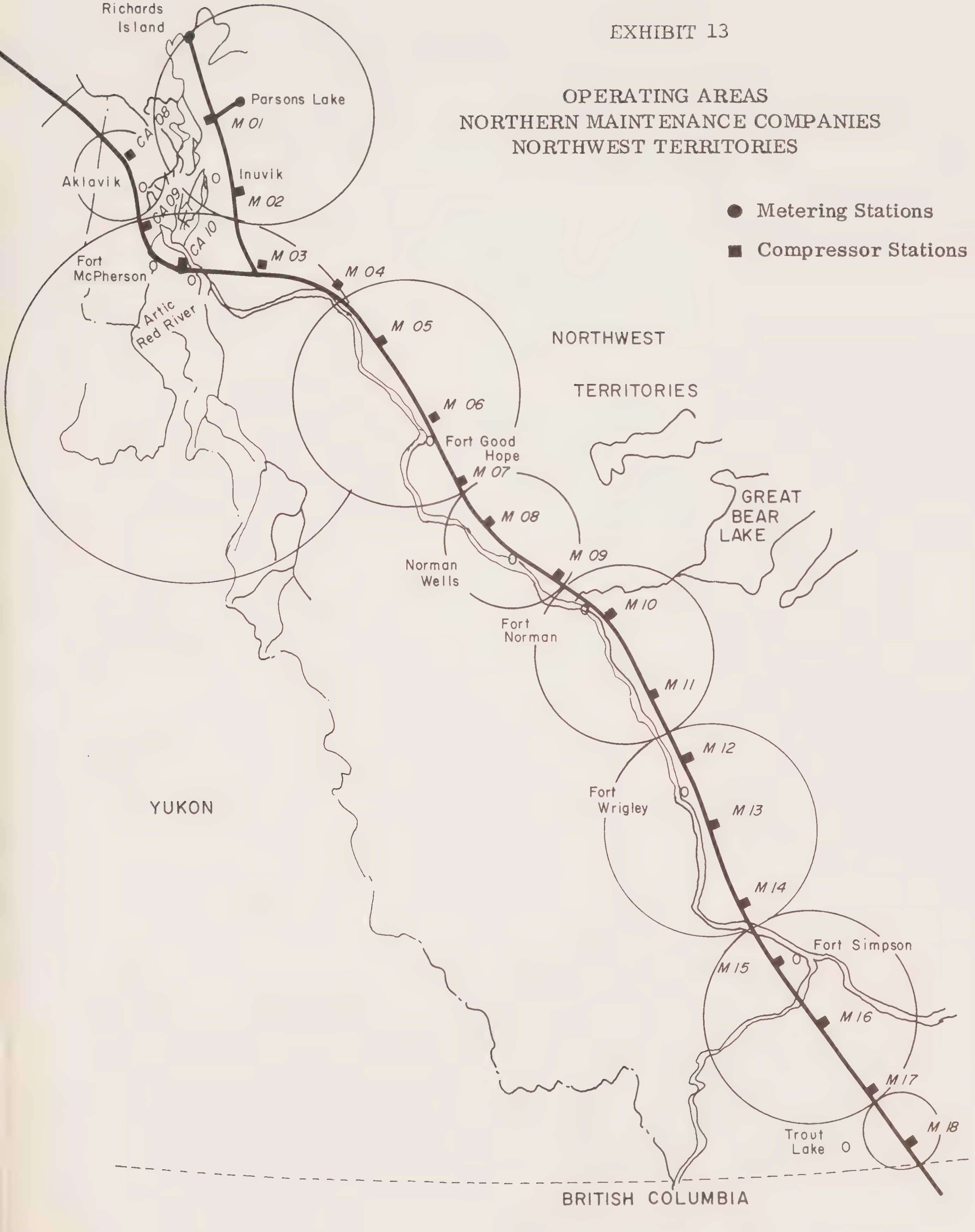
Centre	Pop. of (1) Centre	Miles of Pipe	Comp. Stn.	Meter Stn.	Co. D.O.	Block Valves	Brush Control Miles(2)	Airstrip	'Copter Pads	Comm. Towers	All Weather Road	Winter Snow Road	Winter Snow Trail	Wharfs
Inuvik	4,151	134	2	2	1	3	150.5	1@2400	8	6	1.5	11.5	5.0	1
Aklavik	761	71	1	-	-	2	60.5	1@2400	4	3	2.5	5.5	6.0	1
Ft. McPherson/	761	170	4	-	-	3	22.8	3@6000	8	8	12.0	36.0	22.0	2
Arctic Red River	122													
Ft. Good Hope	421	140	3	-	-	3	18.3	1@2400	7	7	4.0	24.0	19.0	3
Norman Wells	354	80	2	-	1	2	89.5	-	5	5	2.0	1.5	8.0	1
Fort Norman	282	111	2	-	-	3	123	1@2400	6	4	-	8.0	4.0	1
Fort Wrigley	213	131	3	-	-	2	137.5	1@2400	7	6	13.0	-	6.5	2
Fort Simpson	851	108	3	-	1	3	115.5	1@2400	7	6	21.5	1.0	6.5	-
Trout Lake	60	69	1	-	-	1	78	1@6000	2	2	-	-	9.0	-
		1,014	21	2	3	22	992	10	54	47	57.5	87.5	86.0	11

(1) Source: Northwest Territories, Community Data - 1974.

(2) Brush Control Miles - Includes Winter Snow Roads and Trails.

EXHIBIT 13

OPERATING AREAS
NORTHERN MAINTENANCE COMPANIES
NORTHWEST TERRITORIES



The estimated manpower costs are as follows:

* Foreman - two full-time @ $15,000/year	$ 30,000
* General Maintenance, Janitorial and Housekeeping - six full-time @ $12,000/year	72,000
* Part-time - five months per year four-semi-skilled general maintenance @ $7/hour	23,000
* General Labour - four @ $5.50/hour	18,500
TOTAL OPERATING LABOUR COST	$143,500

5.1.3 Administrative and Service Manpower

Heading up the local Organization in Inuvik would be a General Manager who would manage the operation at the local level, have full authority over staff, oversee work assignments and performance, and be responsible for profitable operations.

There would also be a need for a part-time Secretary and Accounts Clerk who would keep all necessary records and accounts and provide typing and filing services. Since some heavy equipment will be required for operations, a Mechanic with heavy equipment and road transport maintenance skills should be on staff.

The estimated administrative and service manpower costs are as follows:

* General Manager	$20,000
* Mechanic @ $8.00 per hour	14,000
* Part-time Clerk/Secretary	5,000
TOTAL ANNUAL COST	$39,000

5.1.4 Equipment and Facilities

Equipment - Field operations must have sufficient equipment to provide year round transport and working equipment. Much of the general maintenance work would be performed during the summer months which will require not only road transport but also certain specialized tracked equipment. Winter conditions will also require suitable multi-purpose equipment.

A list of equipment and estimated laid down costs at Inuvik is shown in Table 8.

Table 8

Transport and Work Equipment Requirements

Description	Use	Cost $
One-Ton Crew Cab Pickup	General transport - material and crews	7,000
One 6 Yard Single Axle Hydraulic Dump Truck with Grader Blade and Snow Plow Attachment	Gravel haulage and general haulage work	22,000
One 8 Man Full Body Snow Track Vehicle (Canadiar Flextrac Type FNIO or similar)	Personnel carrier for summer and winter months	22,500
One 6,000 lb. Payload Tracked Vehicle and Box and Snow Plow (Canadair Flextrac Type FN60 or similar)	Material transport for winter and summer	34,000
	TOTAL COST	85,500

Typical tracked equipment is shown in Appendix A.

Office and Shop Equipment - In addition to general office equipment such as a typewriter, desks, chairs, filing cabinets, etc., equipment should be provided for the repair of transport and work equipment.

* Office Equipment	$1,000
* Shop and Garage Equipment	8,000
TOTAL COST	$9,000

Land and Buildings - A building of about 800 square feet of space would be required to house offices, repair shops and material stores. At a per square foot cost of approximately $30.00, the estimated building cost complete would be approximately $24,000.

Serviced land of about 15,000 square feet (100' x 150') should be provided. The estimated cost of serviced land is $8,000.

TOTAL LAND AND BUILDING COSTS $32,000

5.1.5 Operating Characteristics

The Inuvik Maintenance Organization would be responsible for the performance of all contract maintenance operations on the pipeline section assigned. All tools, maintenance supplies, i.e. paint, brushes, chemicals, fuel, etc. would be supplied as a component of operating and contract expenses.

Because of the remoteness of some of the pipeline facilities, it is probable that some crews will have to fly into these locations. An estimate of these charter costs is allowed for in the pro forma financial statements. In some cases, it may be feasible that the Pipeline Company's air transport would be used to ferry men and supplies to remote areas. If so, no expense for this transport would be expected. However, the operating expense (pro forma) includes estimates of air transport assuming that the Company's air transport would not be available.

It is further assumed that certain pieces of transport and work equipment provided by the Pipeline Company at remote compressor stations etc. would be available for maintenance operations by the local maintenance contractor. No charges are expected for the use of this equipment. It would be impractical to air lift the Maintenance Company's equipment to remote sites. However, where road access from the Mackenzie Highway and the Dempster Highway would probably be available - say in five years - the Maintenance Company would be expected to provide its own equipment at accessible sites when required.

It is also expected that, depending on local conditions and requirements, certain specialized equipment such as front end loaders, vehicle transport equipment, boats, barges, etc. may have to be rented on a periodic basis for short periods of time. Where this equipment is not available locally, provision should be made for the acquisition of this equipment by the local Maintenance Organization for its own use.

This analysis is based solely on the supply of contract services to the Pipeline Company. It is expected that additional contract work could be obtained from other local operations particularly once the Mackenzie Highway is completed.

The above comments pertain not only to the Inuvik Operation but also, in a similar or lesser degree, to other centres.

5.2 Summary of Operating Characteristics - Other Centres

5.2.1 Area of Maintenance Operations, Pipeline Facilities and Estimated Annual Revenues - Other Centres

(a) *Area of Maintenance Operations - Other Centres*

Aklavik	Prudhoe Bay Section, Yukon Border - Mile 329 to Mile 400
Fort McPherson and Arctic Red River	Part of Prudhoe Bay Line - Mile 400 to Mackenzie Junction and part of Mackenzie Section from Mile 119 to Prudhoe Bay Junction and south from Junction to Mile 180
Fort Good Hope	Mackenzie Valley Section from Mile 180 to Mile 320
Norman Wells	Mile 320 to Mile 400
Fort Norman	Mile 400 to Mile 511
Fort Wrigley	Mile 511 to Mile 642
Fort Simpson	Mile 642 to Mile 750
Trout Lake	Mile 750 to Mile 819

(b) *Pipeline Facilities - Other Centres*

See Exhibit XII.

(c) *Estimated Annual Revenues - Other Centres*

See Exhibit XIV.

The estimated annual revenue for each of the other centres along the pipeline are based on the same data used for the Inuvik Operations. The revenue for Trout Lake includes only brush clearing as it is felt that the low population of Trout Lake would mitigate this community undertaking complete participation in the maintenance program.

5.2.2 Operating Manpower - Other Centres

Based on the pipeline facilities of Exhibit XII and the estimated annual revenue of Exhibit XIV, the estimated operating manpower requirements are shown in Exhibit XV.

Staffing by classification and annual costs are shown in Exhibit XVI. It must be noted that the Trout Lake

EXHIBIT 14

Estimated Annual Revenues - Maintenance Areas

	Inuvik	Aklavik	Fort McPherson/Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake[1]
	$	$	$	$	$	$	$	$	$
Compressor Stations	32,000	8,000	32,000	24,000	16,000	16,000	24,000	32,000	-
Airstrip Maintenance	5,000	5,000	24,000	5,000	-	5,000	5,000	13,000	-
Road Maintenance	5,250	8,750	42,000	14,000	7,000	-	45,500	75,250	-
Communication Towers	3,200	1,600	6,400	4,800	3,200	3,200	4,800	6,400	-
Helicopter Pads	19,200	9,600	19,200	16,800	12,000	14,400	16,800	21,600	-
Gravel Stock Piles	24,000	6,000	24,000	18,000	12,000	12,000	18,000	24,000	-
Brush Control	90,300	36,300	136,800	109,800	107,400	147,600	165,000	138,600	93,600
Janitorial and House-keeping									
- District Office	24,000	-	-	-	24,000	-	-	24,000	-
- Compressor Stations	48,000	24,000	96,000	72,000	48,000	48,000	72,000	96,000	-
- Kitchen Services	48,000	16,000	64,000	48,000	32,000	32,000	48,000	64,000	-
TOTALS	298,950	115,250	444,400	312,400	261,600	278,200	399,100	494,850	93,600

[1] With the exception of Brush Control, all items on Trout Lake Section to be maintained by Fort Simpson staff due to Trout Lake's low population and work force skills and work force availability.

EXHIBIT 15

OPERATIONS MANPOWER SCHEDULE - MAN WEEKS - ALL CENTERS

	Inuvik	Aklavik	Ft. McPherson Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake
A. Winter Period (20wks)									
Gravel Stock Pile	35	9	34	26	17	17	26	34	*
B. Summer Period (20wks)									
Compressor Stations	20	20	80	60	40	40	60	80	*
Communication Towers	12	6	16	14	10	8	12	16	*
Brush Control	151	61	228	183	179	246	275	231	156
	183	87	324	257	229	294	347	327	156
C. All Year (50wks.)									
Airstrip	7	7	34	7	-	7	7	19	*
Roads	8	8	60	20	10	-	65	108	-
Helicopter Pads	16	10	19	17	12	14	17	22	*
Janitorial & Housekeeping									
Offices	52	-	-	-	52	-	-	52	-
Compressor Stations	208	26	104	78	52	52	78	104	*
Kitchen	104	35	139	104	69	69	104	139	*
	364	86	356	226	195	142	271	444	
Weather Allowance 10%	25	12	47	33	27	33	46	51	16
TOTAL MAN WEEKS	607	194	761	542	468	486	690	856	172
Number of Operating Staff (est)									
Full Time (50 weeks)	8	2	10	7	6	6	8	10	
Part Time (summer at 20 wks /man	8	5	13	10	9	10	15	18	7

* Trout Lake Foreman Hired for Five Months.

EXHIBIT 16

OPERATIONS STAFFING AND ANNUAL COSTS - ALL CENTERS

	Inuvik	Aklavik	Ft. McPherson Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake
Foremen @ $15,000/yr.									
Number	2	1	2	2	2	2	2	2	1*
Cost	$ 30,000	$ 15,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 30,000	$ 6,000*
General Maintenance, Janitorial & House-keeping @ $12,000/yr.									
Number	6	1	8	5	4	4	6	8	-
Cost	$ 72,000	$ 12,000	$ 96,000	$ 60,000	$ 48,000	$ 48,000	$ 72,000	$ 96,000	-
Part Time Semi-skilled @ $7.00/hr.									
Number	4	3	6	4	4	4	6	8	-
Cost	$ 23,000	$ 16,800	$ 33,600	$ 22,400	$ 22,400	$ 22,400	$ 33,600	$ 44,800	-
General Labour @ $5.50/hr.									
Number	4	2	7	6	5	6	9	10	7
Cost	$ 18,500	$ 8,800	$ 30,800	$ 26,400	$ 22,000	$ 26,400	$ 39,600	$ 44,000	-
Total Annual Operating Labour Cost	$143,500	$ 52,600	$190,400	$138,800	$122,400	$126,800	$175,200	$214,800	$ 30,800

* Trout Lake Foreman hired for five months.

operation, due to its low population, would be limited to brush control. A part-time Foreman was included in the labour cost estimates. Operationally, the Trout Lake section of the pipeline would be managed by the Fort Simpson Operation.

5.2.3 Administrative and Service Manpower - Other Centres

Exhibit XVII shows the manpower requirements for the other maintenance centres and the estimated wage costs. Although a Mechanic is shown as a full-time employee, his mechanical maintenance work on the centre's equipment would probably not keep him fully employed. He could therefore, be used an an operational maintenance worker as time and work load required.

5.2.4 Equipment and Facilities - Other Centres

Transport and work equipment and their costs as well as office equipment, maintenance equipment and land and building costs and requirements are shown in Exhibit XVIII for the other centres.

For the Fort McPherson and Arctic Red River section of operations it is suggested that the office be located in Fort McPherson. One of the Foremen should be located in Arctic Red River and be supplied with road transport.

6. ORGANIZATIONAL CHARACTERISTICS

The organization structure for each of the maintenance Operations is fairly simple. However, with the administrative staff proposed for the local Organization, there is need for additional strength which could be provided by an overall Corporate organization approach. It is further suggested that each of the centres be owned and operated by the native people of the North. There are several advantages which would provide strength to the native organizations in meeting any technical and administrative requirements, if an overall Corporate Organization were adopted. These are:

* general accounting and control systems could be

EXHIBIT 17

ADMINISTRATIVE AND SERVICE MANPOWER - OTHER CENTERS

	Inuvik	Aklavik	Ft. McPherson Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake
General Manager									
Number	1	1	1	1	1	1	1	1	-
Salary	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	$ 20,000	-
Clerical/Secretarial									
Number	½	½	½	½	½	½	½	1	-
Salary	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 5,000	$ 10,000	-
Mechanic *									
Number	1	1	1	1	1	1	1	1	-
Salary	$ 14,000	$ 14,000	$ 14,000	$ 14,000	$ 14,000	$ 14,000	$ 14,000	$ 14,000	-

* Mechanics would not be fully employed and would be used in an operational maintenance capacity when required.

EXHIBIT 18

Capital Equipment and Facilities - All Centres

	Inuvik	Aklavik	Fort McPherson/Arctic Red River	Fort Good Hope	Norman Wells	Fort Norman	Fort Wrigley	Fort Simpson	Trout Lake
One Ton Pick-Up/Crew									
- Number	1	-	2	1	1	1	1	2	-
- Cost	$ 7,000	-	$14,000	$ 7,000	$ 6,950	$ 6,950	$ 6,950	$13,800	-
Six Yard Dump Truck									
- Number	1	-	1	1	1	1	1	1	-
- Cost	$22,000	-	$22,000	$22,000	$22,000	$22,000	$22,000	$22,000	-
Eight Man Snow Track									
- Number	1	1	2	1	1	1	1	2	1
- Cost	$22,500	$22,500	$45,000	$22,500	$22,400	$22,400	$22,300	$44,000	$22,500
Three Ton Snow Track with Box and Attachments									
- Number	1	1	1	1	1	1	1	2	-
- Cost	$34,000	$34,000	$34,000	$34,000	$33,300	$33,300	$33,200	$66,400	-
Office Equipment	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,000	$ 1,500	$ 500
Shop/Garage Equipment	$ 8,000	$ 3,000	$10,000	$ 8,000	$ 8,000	$ 8,000	$ 8,000	$12,000	$ 1,000
Land-Square Feet	15,000	10,000	15,000	15,000	15,000	15,000	15,000	20,000	5,000
- Cost	$ 8,000	$ 5,000	$ 6,000	$ 6,000	$ 6,000	$ 5,000	$ 5,000	$ 8,000	$ 2,000
Building-Estimated Sq.Ft.	800	600	800	800	800	800	800	1,000	400
- Estimated Cost/Sq.Ft.	$ 30	$ 40	$ 35	$ 30	$ 25	$ 25	$ 25	$ 20	$ 30
- Total Cost	$24,000	$24,000	$28,000	$24,000	$20,000	$20,000	$20,000	$20,000	$12,000

developed and administered on a centralized basis;

* a strong central managerial staff could lend direct assistance to the local General Managers, particularly in those areas where skills are lacking or not fully developed;
* assistance and advice could be provided by the central Organization on technical, administrative, accounting, budgeting and operations control matters;
* financial control could be assumed by the central Organization, even though each local Organization would own its own operation;
* centralized legal and auditing services could be used to the benefit of each separate Organization even though a consolidated Organization existed in an operational sense;
* the central Organization would be able to provide excellent training and direction to administrative and operation staff.

It is therefore suggested that a Holding Company type of central Organization be developed such as "The Northern Maintenance Corporation". As part of the Holding Company each locality would establish their own Company, i.e. Fort Simpson Maintenance Limited. Each local Company would be assessed an administrative charge by the Holding Company to cover the operations and services provided by the Holding Company.

Essentially, the native organization in each locality would own its Company and have representation in the Holding Company's Board of Directors. The Holding Company would have complete control through policies established by the Board, over all the financial and operational activities of each local Organization.

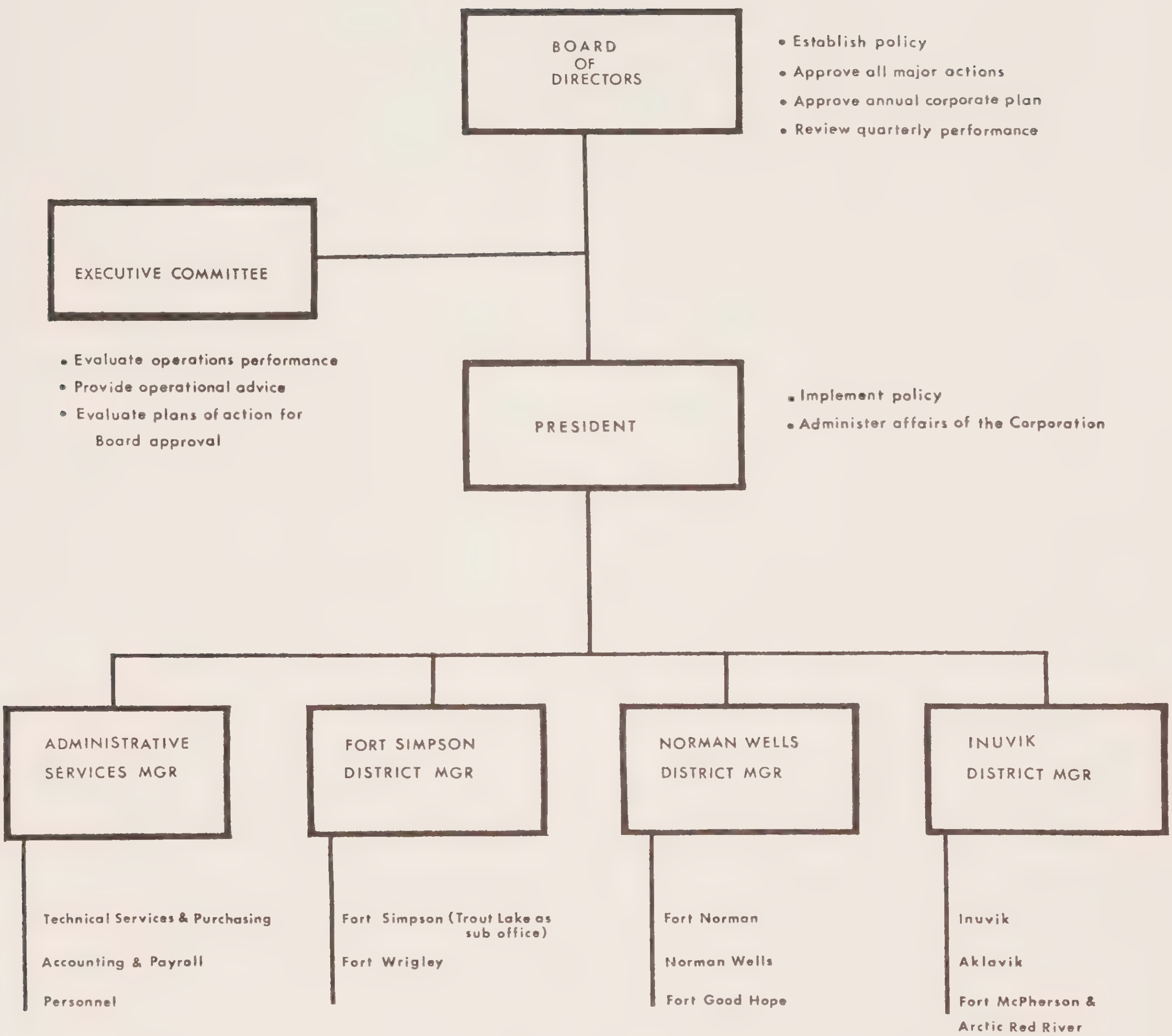
6.1 Organization Structure

Exhibit XIX shows the suggested organization structure for "The Northern Maintenance Corportion".

6.1.1 The Board of Directors

The Board of Directors would meet at least twice a year to review the activities of the Corporation

EXHIBIT 19



THE NORTHERN MAINTENANCE CORPORATION

and to make plans and policy decisions pertaining to the continuing operation of the business.

Since proposed financing (see section 7) is suggested to be provided by the Indian Economic Development Loan Fund administered by the Department of Indian and Northern Affairs, one member of the Board should be from INA. There would also be one member from the Government of the Northwest Territories; one from each of the native organizations (with a total of ten members); and the President of the Corporation would represent the Operating Company and act as the Chairman.

6.1.2 President

The President of the Corporation should either be seconded from Government or be hired on a contract basis from the business community. The individual must have strong administrative and management skills, particularly in the area of contract negotiations, construction operations and be very familiar with northern business practices. As Chairman of the Board and President, he would have a singular degree of autonomy in operations and have the necessary authority to implement Board approved policies at all levels of the Corporation. The President would also act as Chairman of the Executive Committee.

6.1.3 Administrative Services Manager

The Administrative Services Manager may or may not come from within the Government or business sectors of the Northwest Territories. He should have experience in finance and accounting related to contract management enterprises and possess a broad technical background in the operating aspects of this type of organization. He would be a member of the Executive Committee.

6.1.4 District Managers

The District Managers would have direct operational control over the local Maintenance Companies in their respective districts. It is hoped that these individuals would be found within the Northwest Territories. However, they must have a broad technical and operational experience in contract operations. It is probable that they would more likely be attracted from

outside. They would also be members of the Executive Committee.

6.1.5 Executive Committee

The members of the Executive Committee would be the President as Chairman, the Administrative Services Manager, District Managers and the representative of INA. The Executive Committee would meet periodically as the occasion warranted to review progress and make plans for future operations for Board approval.

6.1.6 Corporation Support Staff

It is estimated that the following Corporate staff would be required:

* Technical Services and Purchasing (one Manager plus a Secretary);
* Accounting (one Accountant plus three Clerks);
* Secretarial (one each for the President and the Administrative Services Manager).

6.1.7 Location of Corporation Offices

Corporate offices could be located in any of the three proposed locations that the Pipeline Operating Company plans for its District Operation Centres.

Although the Company's Division Office is planned for Inuvik it is not a good location for the Northern Maintenance Corporation's office as:

* it is not central;
* competition for office staff would be more severe in Inuvik than, say, in Norman Wells or Fort Simpson, as the present labour market would only become more accute with the accelerated oil and gas development in the Delta;
* until such time as the Mackenzie Highway would reach it, ease of travel would be restricted and be dependent solely on air services;

* other communities, especially native communities, need employment opportunities more than Inuvik.

Norman Wells is central, but presently is restricted to air transport for travel. Because of its size and isolation there may be some difficulty in attracting and/or finding staff. It would also be illogical to locate a native organization in a non-native community, especially when the native communities critically need both business and employment opportunities.

Fort Simpson is reasonably central; connected by an all-weather road; of a size and location that would attract and/or enable staff to be found from within; and contains a native population and leadership that has already exhibited entrepreneurial qualities. However, in the final analysis, the choice of location of the Corporate offices becomes one of preference. For the purpose of this report we are suggesting Fort Simpson.

The office space required would be approximately 2,500 square feet. It is unlikely that suitable office space would be found in Fort Simpson thus an office structure would have to be built at an estimated cost of $87,500 ($35.00 per square foot). A minimum of 10,000 square feet of land should be provided; slightly less if the Corporation office and Fort Simpson Maintenance Limited shared the same property. Serviced land for the office is estimated at $5,000. Office furniture requirements are estimated at $20,000. This would also provide furniture for the Corporations's District Manager; the other two would use the facilities of the Maintenance Company at Inuvik and Norman Wells.

6.1.8 Staff Costs

Table 9 shows the estimated salaries to be paid to the Holding Company personnel.

7. FINANCING AND CORPORATE OWNERSHIP

There are a number of avenues available for financing both the Corporation and each individual Maintenance Company. As the success of the operation depends

on being able to attract competent people to manage both the Corporate and local operations, a means should be considered to attract Investor/Managers who have both business experience and capital to invest for profit at each level of the Organization.

Table 9

Staff Salaries - Northern Maintenance Corporation

		Annual Salary $
President		30,000
Administrative Services Manager		26,000
District Managers (3 @ $25,000)		75,000
Technical Services and Purchasing		22,000
Accountant		18,000
Secretarial	Senior (1 @ $10,000)	10,000
	Intermediate (2 @ $9,000)	18,000
	Junior (1 @ $8,000)	8,000
Accounts Clerks (3)		30,000
TOTAL SALARIES		237,000

7.1 Capital Requirements

Exhibit XX shows the capital requirements for each local Maintenance Company and the Corporate Holding Company. Total estimated capital expenditure of $1,195,850 would be required to finance all the project.

The Applicant has indicated that there will be excess equipment available for local communities (first call) after construction is finished. It is therefore possible that much of the transport and work equipment could be obtained used (from the Applicant) at a reasonable cost. As this equipment may probably be partially depreciated over the construction period, and the Applicant may wish to provide some financial assistance to the proposed venture, it is suggested that the required transportation and work equipment be purchased from the Pipeline Company at 30% of original value, on a five year payment basis at a rate of 9% per annum. On this basis, the total capital expenditure on equipment and facilities is estimated to be approximately $660,000.

Because of the "used" nature of the equipment,

EXHIBIT 20

Capital Expenditure Requirements, Northern Maintenance Corporation, Local Maintenance Companies

Maintenance Company	Land	Buildings	Maintenance Equipment	Office Equipment	Transportation and Work Equipment	TOTAL
	$	$	$	$	$	$
Northern Maintenance Corporation	5,000	87,500	-	20,000	-	112,500
Inuvik	8,000	24,000	8,000	1,000	85,500	126,500
Aklavik	5,000	24,000	3,000	1,000	56,600	80,500
Fort McPherson and Arctic Red River	6,000	28,000	10,000	1,000	115,000	160,000
Fort Good Hope	6,000	24,000	8,000	1,000	85,500	124,500
Norman Wells	6,000	20,000	8,000	1,000	84,650	119,650
Fort Norman	5,000	20,000	8,000	1,000	84,650	118,650
Fort Wrigley	5,000	20,000	8,000	1,000	84,450	118,450
Fort Simpson	8,000	20,000	12,000	1,500	146,600	188,100
Trout Lake	2,000	12,000	1,000	500	22,500	38,000
CONSOLIDATED REQUIREMENTS	56,000	279,500	66,000	29,000	765,350	1,195,850

it is probable that new replacement equipment will have to be purchased on a continuing basis starting in the second year of operation. The purchase of this replacement equipment is suggested to be at a rate of $200,000 per year for three years and $100,000 per year in subsequent years.

7.2 Financing

In order to foster the development of native people enterprises, it is suggested that INA through the Indian Economic Development Loan Fund provide the schedule of financing as indicated in Table 10. The loan capital is assumed to be at a rate of 9% for a period of ten years.

Table 10

Proposed Financing for Maintenance Operations
Indian Economic Development Fund - INA

Company	Financing Required	Source - INA: Capital Grant	Source - INA: Loan Capital
	$	$	$
Inuvik	41,000	10,000	31,000
Aklavik	33,000	10,000	23,000
Fort McPherson and Arctic Red River	45,000	10,000	35,000
Fort Good Hope	39,000	10,000	29,000
Norman Wells	35,000	10,000	25,000
Fort Norman	34,000	10,000	24,000
Fort Wrigley	34,000	10,000	24,000
Fort Simpson	41,500	10,000	31,500
Trout Lake	15,500	10,000	5,500
Northern Maintenance Corporation	112,500	30,000	82,500
TOTAL	430,500	120,000	310,000

It is also suggested that the Pipeline Company finance equipment acquisition as indicated in section 7.1 at a rate of 9% for five years. This represents a capital loan of $229,605. In addition to this financing, first year working capital requirements are estimated to be about $10,000 per local Maintenance Operating Company

(Trout Lake $3,000) with the Holding Company's requirements at start up being about $20,000. This would be financed by a line of credit at the bank at a rate of 12% per year. The total working capital (line of credit) requirements would be about $103,000, of which an average of one-half ($51,500 would be outstanding throughout the year.

In some locations there may not be the managerial skills available to initially operate the Company. In this case, it may be possible to attract a entrepreneur as an Investor/Manager who for a modest sum, say $10,000 would invest in the local Company for a 40% interest. The balance would remain with the local native organization supported by INA. The Investor/Manager would operate the local Company under a five or ten year contract and be bought out by the local organization under the terms of the management agreement.

However, since the maintenance operation would not commence until after pipeline completion, it is probable that there will be several individuals in each area who would have gained valuable work experience (including supervisory experience) during the pipeline construction phase. These individuals could form the managerial backbone of the local Organization. Also, having identified the skills required a comprehensive training program could be undertaken during and/or in conjunction with the pipeline construction phase.

8. FINANCIAL FEASIBILITY

8.1 Northern Maintenance Corporation

The Holding Company, the Northern Maintenance Corporation, would provide the administrative, technical and managerial support for all the Operating Companies.

The expenses of operating the Holding Company would be charged to the operations of each local Company as an administrative charge. Table 11 shows an estimate of the annual expenses which would be prorated to each local Company in proportion to local revenues.

Table 11

Estimated Annual Expenses
Northern Maintenance Corporation

Salaries	$237,000
Fringe Benefits (9%)	21,330
Supplies and Office Expenses	5,000
Travel and Expenses	40,000
Light, Heat, Power, Telephone	10,000
Office Maintenance	10,000
Entertainment	5,000
Insurance	500
Legal and Audit	20,000
Depreciation - Land and Building @ 20 years ($92,500)	4,625
Interest on Debt (first year)	7,425
Interest on Working Capital	1,200
TOTAL ANNUAL EXPENSES	$362,080

Since it is assumed that the administrative operation of the Holding Company is to be non-profit (all profits accruing to the local Companies), and that the Holding Company's capital debt is to be repaid through the administrative assessment, the estimated annual service charge would be as follows:

* Total Annual Expenses (Table 7)	$362,080
* Capital Debt Retirement (INA: $82,500 @ 9% for 10 years)	8,250
TOTAL ANNUAL CHARGE	$370,330

NOTE: It is assumed that depreciation charges and decreasing scale of interest charges would be used to provide working capital and equipment replacement.

For the purposes of this report the total annual service charge to be borne by all the operating Companies would be $375,000.

8.2 Pro Forma Financial Statements - Consolidated for Operating Companies

Exhibit XXI through XXIV show the pro forma consolidated financial statements for the total operations for the first five years. The pro formas do not show a breakdown of the expenses or financing of the Holding Company. These expenses are shown only as an administrative charge against the operations of the local Companies.

Net profits are projected to run at between 5% and 6% of sales (contract revenue). The pro forma statements shown are:

* Exhibit XXI Consolidated Profit and Loss;
* Exhibit XXII Consolidated Depreciation Schedule;
* Exhibit XXIII Consolidated Balance Sheet and Statement of Retained Earnings;
* Exhibit XXIV Consolidated Source and Application of Funds.

The Holding Company's estimated annual expenses, as applied, are shown in Table 7 of section 8.1.

9. PIPELINE COMPANY PARTICIPATION

We are of the opinion that the Applicant would be prepared to support and/or participate in the Maintenance Companies' operations for the following reasons:

* the need to work closely with the Maintenance Companies in order to ensure proper performance of contracts;
* the need to train maintenance employees in the proper operational and safety aspects of working with and on pipeline facilities;
* the Pipeline Company's desire to assist the northern people in taking part in every available opportunity.

No provision was made to have a representative of the Pipeline Company on either the Board of Directors or the Executive Committee. Some participation by the Company, however, would be welcome. It is suggested that the Pipeline Company participate at the Executive

EXHIBIT 21

CONSOLIDATED PRO FORMA PROFIT & LOSS STATEMENT
ALL COMPANIES - NORTHERN MAINTENANCE CORPORATION
CONSTANT 1974 DOLLARS

	Year 1	Year 2	Year 3	Year 4	Year 5
Contract Revenue	$2,648,350	$2,648,350	$2,648,350	$2,648,350	$2,648,350
Operating Expenses					
Operating Staff	$1,195,300	$1,195,300	$1,195,300	$1,195,300	$1,195,300
Maintenance	112,000	112,000	112,000	112,000	112,000
	$1.307,300	$1,307,300	$1.307,300	$1.307,300	$1.307.300
Fringe Benefits	$ 117,657	$ 117,657	$ 117,657	$ 117,657	$ 117,657
Tools & Supplies	10,000	10,000	10,000	10,000	10,000
Fuel & Lubrication	20,000	20,000	20,000	20,000	20,000
Maintenance Expense	16,000	16,000	16,000	16,000	16,000
Air Charter	40,000	40,000	40,000	40,000	40,000
Equipment Rental	20,000	20,000	20,000	20,000	20,000
Dep. -Operating Equipment	45,921	76,737	101,389	121,112	116,889
-Maintenance Equip.	13,200	10,560	8,448	6,758	5,407
	$1,590,078	$1,618,254	$1,640,794	$1,658,827	$1,653,253
Operating Profit (Loss)	$1,058,272	$1,030,096	$1,007,556	$ 989,523	$ 995,097
Administration					
Salaries	$ 205,000	$ 205,000	$ 205,000	$ 205,000	$ 205,000
Fringe Benefits	18,450	18,450	18,450	18,450	18,450
Light, Heat, Power, Teleph.	30,000	30,000	30,000	30,000	30,000
Office Supplies	4,000	4,000	4,000	4,000	4,000
Travel and Expenses	30,000	30,000	30,000	30,000	30,000
Dep. - Land & Buildings	12,150	11,542	10,965	10,417	9,896
-Office Equipment	1,800	1,440	1,152	922	737
Insurance	10,000	10,000	10,000	10,000	10,000
Interest Expense	46,164	35,000	28,815	22,630	16,445
	$ 357,564	$ 345,432	$ 338,382	$ 331,419	$ 324.528
Start-up Costs	$ 200,000				
Corporate Admin. Exp.	$ 375,000	$ 375,000	$ 375,000	$ 375,000	$ 375,000
	$ 932,564	$ 720,432	$ 713,382	$ 706,419	$ 699,528
Gross Profit	$ 125,708	$ 309,664	$ 294,174	$ 283,104	$ 295,569
Taxes (1) (50%)	$ 62,854	$ 154,832	$ 147,087	$ 141,552	$ 147,784
Net Profit (Loss)	$ 62,854	$ 154,832	$ 147,087	$ 141,552	$ 147,785

(1) Taxes would probably be less if taxation calculated on an individual operating Company basis.

EXHIBIT 22

CONSOLIDATED DEPRECIATION SCHEDULE

	Year 1	Year 2	Year 3	Year 4	Year 5
Land and Buildings					
Opening	$243,000	$230,850	$219,308	$208,343	$197,926
Depreciation (5%)	12,150	11,542	10,965	10,417	9,896
Closing	$230,850	$219,308	$208,343	$197,926	$188,030
Operating Equipment (1)					
Opening	$229,605	$183,684	$306,947	$405,558	$484,446
Additions	-	200,000	200,000	200,000	100,000
Depreciation (20%)	45,921	76,737	101,389	121,112	116,889
Closing	$183,684	$306,947	$405,558	$484,446	$467,557
Maintenance Equipment					
Opening	$ 66,000	$ 52,800	$ 42,240	$ 33,792	$ 27,034
Depreciation (20%)	13,200	10,560	8,448	6,758	5,407
Closing	$ 52,800	$ 42,240	$ 33,792	$ 27,034	$ 21,627
Office Equipment					
Opening	$ 9,000	$ 7,200	$ 5,760	$ 4,608	$ 3,686
Depreciation (20%)	1,800	1,440	1,152	922	737
Closing	$ 7,200	$ 5,760	$ 4,608	$ 3,686	$ 2,949
TOTAL DEPRECIATION	$ 73,071	$100,279	$121,954	$139,209	$132,929
ASSET VALUE YEAR END	$474,534	$574,255	$652,301	$713,092	$680,163

EXHIBIT 23

CONSOLIDATED PRO FORMA BALANCE SHEET (1)

	Start Year 1	Year 1	Year 2	Year 3	Year 4	Year 5
Assets						
Property & Equipment	$547,605	$474,534	$574,255	$652,301	$713,092	$680,163
Cash	41,500	108,704	95,094	95,414	107,454	219,447
	$589,105	$583,238	$669,349	$747,715	$820,546	$899,610
Liabilities						
Owner's Equity	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000	$ 90,000
Loan - DIANA	228,000	205,200	182,400	159,600	136,800	114,000
- Applicant	229,605	183,684	137,763	91,842	45,921	-
- Bank	41,500	-	-	-	-	-
Retained Earnings	-	104,354	259,186	406,273	547,825	695,610
	$589,105	$583,238	$669,349	$747,715	$820,546	$899,610

CONSOLIDATED PRO FORMA STATEMENT OF RETAINED EARNINGS

	Start Year 1	Year 1	Year 2	Year 3	Year 4	Year 5
Balance of Start Year	$ 41,500	$ 41,500	$104,354	$259,186	$406,273	$547,825
Income for Year	-	62,854	154,832	147,087	141,552	147,785
Balance Forward	$ 41,500	$104,354	$259,186	$406,273	$547,825	$695,610

Note: (1) Does not include holding company accounts as all H.C. charges applied as an administrative charge against Operating Companies.

EXHIBIT 24

Consolidated Pro Forma Source and Application of Funds

	Year 1	Year 2	Year 3	Year 4	Year 5
	$	$	$	$	$
Source of Funds					
Owner's Equity	90,000	-	-	-	-
Debt: INA ($228,000 @ 9%)	228,000	-	-	-	-
Applicant ($229,605 @ 9%)	229,605	-	-	-	-
Bank ($ 41,500 @ 12%)	41,500	-	-	-	-
Decrease in Working Capital	-	13,610	-	-	-
Depreciation	73,071	100,279	121,954	139,209	132,929
Net Income	62,854	154,832	147,087	141,552	147,785
	725,030	268,721	269,041	280,761	280,714
Application of Funds					
Additions - Buildings and Equipment	547,605	200,000	200,000	200,000	100,000
Debt Repayment - INA	22,800	22,800	22,800	22,800	22,800
- Applicant	45,921	45,921	45,921	45,921	45,921
- Bank	41,500	-	-	-	-
Increase in Working Capital	67,204	-	320	12,040	111,993
	725,030	268,721	269,041	280,761	280,714
Working Capital (exDepreciation)					
Working Capital Beginning Year	41,500	108,704	95,094	95,414	107,454
Increase (Decrease) Cash	67,204	(13,610)	320	12,040	111,993
	108,704	95,094	95,414	107,454	219,447
Working Capital Change	67,204	(13,610)	320	12,040	111,993

Committee level to provide operational and training requirement guidance. It is also suggested that the Pipeline Company provide Operational Liaison Officers at each of their District Offices to work closely with the District Managers of the Northern Maintenance Corporation as well as the local Maintenance Organizations in their districts.

This close working relationship would be essential, particularly in the early years of pipeline operation, as many of the operating and maintenance characteristics of the facilities would only be established after two or more years of continuous operation. It is also suggested that the training facilities and staff of the Pipeline Company would be made available to provide pipeline related training to the staff of the local Maintenance Organizations.

10. IMPLEMENTATION

Once approval has been given for the construction of the Mackenzie Valley Pipeline, plans should be developed for the implementation of the Northern Maintenance Corporation and the local Maintenance Companies. Although the concept must be in phase with pipeline construction, the development of action plans should be started as soon as possible. The items of an implementation program are in two phases, as outlined below.

PHASE I - Pipeline Construction Period

1. Obtain approval in principle of the broad concepts of the project by the Federal Government, Government of the Northwest Territories and the Pipeline Operating Company.

2. Establish a project planning team to develop broad operational and financial guidelines. This team could be headed by the proposed President of the Holding Company. The team could consist of a Project Leader, a Financial Advisor and a representative of the Department of Indian and Northern Affairs.

3. Once broad guidelines are established and approved by Government, approach representatives of native people organizations in each area to outline approach and obtain committment. At this point, the project

team should be expanded to include a representative of native people.

4. During the late stages of construction, obtain a committment from the Pipeline Operating Company for maintenance contracts on behalf of each local Organization.

5. Obtain financing committment from recommended sources.

6. Search for and select senior staff at the local operating levels, with the involvement of the native people organizations.

7. Search for and select senior Holding Company staff.

8. At least 12 months prior to actual start of pipeline operations, commence construction of local offices and Holding Company office. This would require an estimated $200,000 of Holding Company expense to cover salaries, office construction, management and local organization expense prior to actual maintenance contract activities.

9. Concurrent with Step 8, make a detailed evaluation of equipment requirements to be supplied by Pipeline Operating Company and establish terms of purchase.

10. Develop operating and control systems.

11. With Pipeline Operating Company start training operating staff.

12. Start maintenance operations.

RMC Resources Management Consultants Ltd. would be pleased to work with the project team during the formulation of the details of operation, selection of facilities, development of systems, selection of staff and implementation of the action operations of the Northern Maintenance Corporation and its operating units.

APPENDIX I

TYPICAL TRACKED VEHICLES

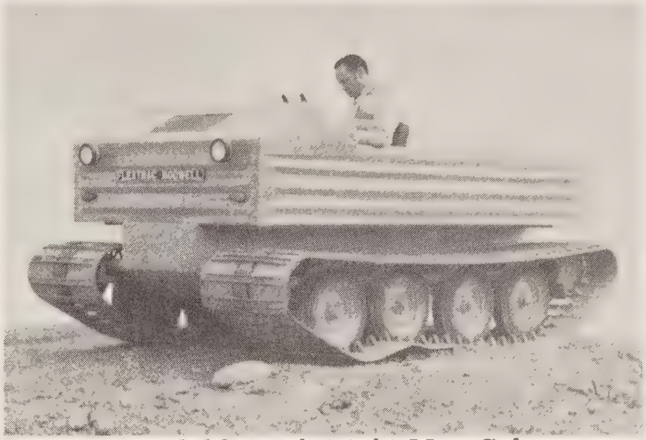
(a) Eight Man Vehicle
(b) 6000 Pound Payload Vehicle

STANDARD SPECIFICATIONS FOR MODEL FN10

Canadair Flextrac Ltd.

P.O. Box 5544 Station A
Calgary, Alberta, Canada T2H 1X9

REPRESENTED BY



Available with Eight Man Cab

GENERAL DATA

	25" track	34" Snow track
Weight - 2-man cab	3550 lb 1615 kg	3825 lb 1735 kg
- personnel body	3950 lb 1795 kg	4200 lb 1900 kg
Gross Weight	4950 lb 2249 kg	5225 lb 2365 kg
Track area 6" penetration	4900 sq in 3.16 m^2	6800 sq in 4.39 m^2
Ground pressure - unloaded - 2-man cab	1.00 psi 0.0703 kg/cm^2	0.73 psi 0.05 kg/cm^2
- personnel body	1.18 psi 0.83 kg/cm^2	0.87 psi 0.06 kg/cm^2
Ground pressure - loaded	1.37 psi 0.096 kg/cm^2	1.02 psi 0.0703 kg/cm^2
Overall width	85.5 in 217 cm	94.5 in 240 cm
	front	*rear*
Free board - unloaded	6.5 in 17 cm	18 in 46 cm
- loaded	10 in 25 cm	6 in 15 cm

Payload	1000 lb 454 kg
Overall width - tracks off	68.5 in 174 cm
Overall height - less cab	57 in 145 cm
- with cab	80 in 203 cm
Overall length	127 in 323 cm
Maximum speed	22 mph 35 km/h
Ground clearance - loaded	13 in 33 cm
Turning radius - minimum inside	138 in 350 cm
Fording depth	Amphibious
Climbing ability - grade	60 %
Sidehill ability - grade	40 %
Cargo area	28.8 sq ft 2.67 m^2

MECHANICAL STANDARDS

Power Train:
Engine - Ford 104 C.I.D. V-4 gasoline 65 H.P.
Transmission - 3-speeds forward; 1 reverse.
Auxiliary - 2-speed transfer case
Final drive - Controlled planetary differential in oil bath aluminum case
Steering - Manual levers to hydraulic system
Brakes - Differential and drive line.

Running Gear:
Load wheels: Rims - 12 x 3, 4-stud
Tires - 4:50/5:30 x 12, 6-ply
Suspension - Niedhart, rubber in compression
Tracks - Rubber belt and channel grousers
Sprockets - Aluminum with urethane
Elevated front idlers - Solid rubber tires

Electrical:
Alternator - 38 amp
Battery - 70 amp/hr
Instruments: Temperature light; ammeter; oil pressure light; hourmeter; fuel gauge.

Body:
Aluminum floater box, two man seating, headlights, manual choke, fuel capacity - 15 imperial gallons (68 litres), color - International orange.

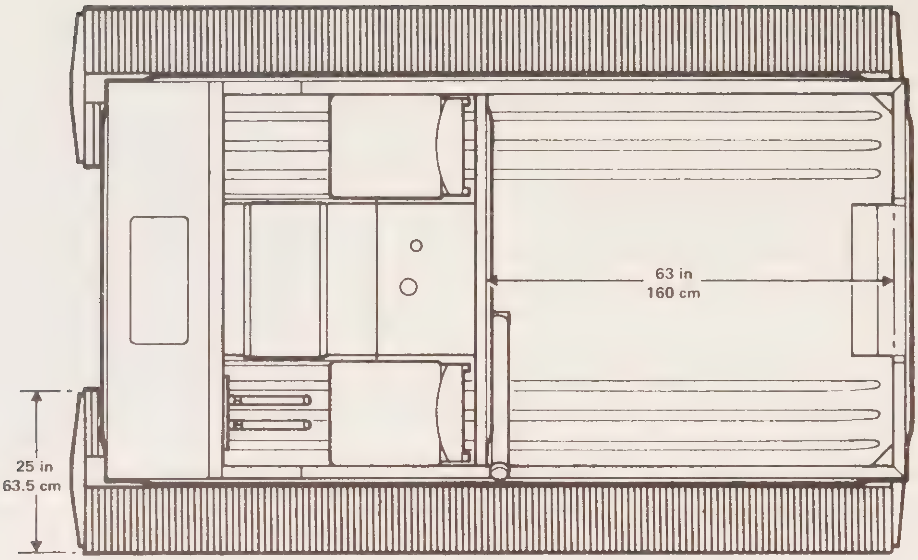
Frame:
Steel

MISCELLANEOUS STANDARD EQUIPMENT

Operator's, maintenance and parts manuals (2 sets)
Antifreeze
Muffler
Tool Kit
Pintle hook

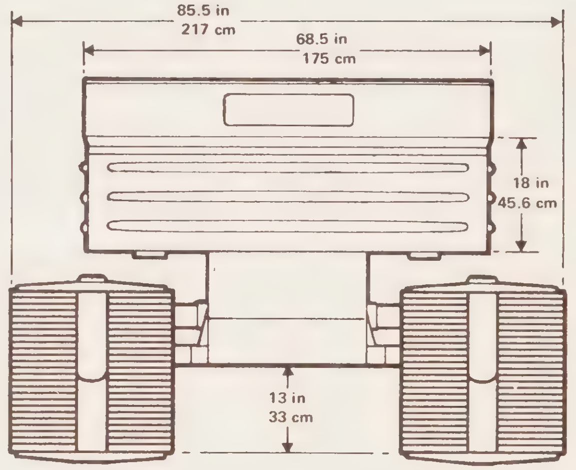
OPTIONS AVAILABLE including diesel engines and automatic transmissions. *Subject to change without notice*

FN10

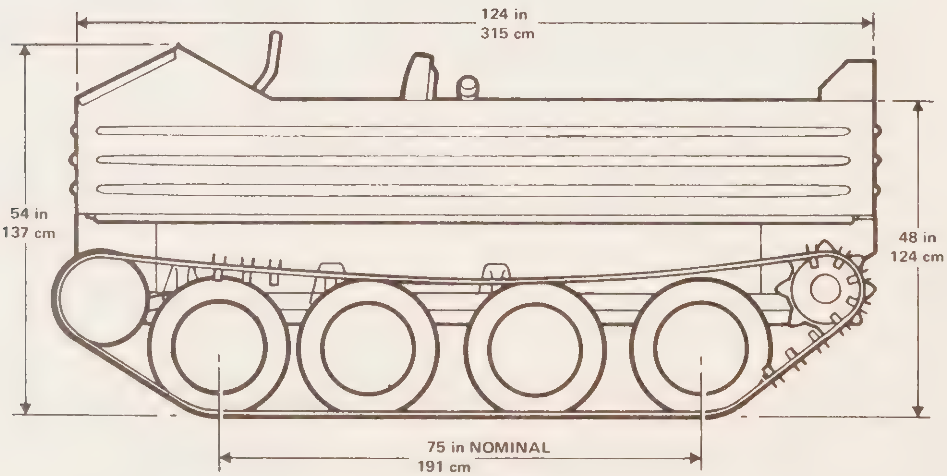


63 in
160 cm
25 in
63.5 cm

NOTES



85.5 in
217 cm
68.5 in
175 cm
18 in
45.6 cm
13 in
33 cm

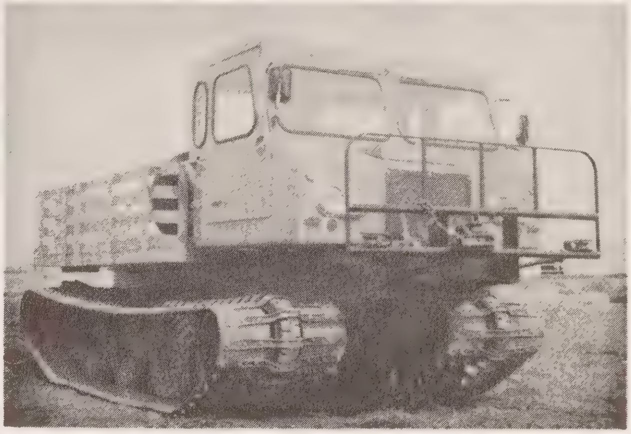


124 in
315 cm
54 in
137 cm
48 in
124 cm
75 in NOMINAL
191 cm

STANDARD SPECIFICATIONS FOR MODEL FN 60

Canadair Flextrac Ltd.
P.O. BOX 5544 STATION A
1201 - 42 Ave. S.E. Calgary, Alberta
Telephone 403 287-2280 Telex Can-Flex 03-821566

REPRESENTED BY



GENERAL DATA

Weight — basic	10400 lb 4710 kg	Overall height	94.5 in 240 cm
Payload	6000 lb 2720 kg	Overall length	204.75 in 520 cm
Gross weight	16400 lb 7440 kg	Frame section modulus	89.7 cu in 1469.9 cm^3
Track area at 6″ penetration	8958 sq in 5.79 m^2	Maximum speed at 3800 eng rpm	12.2 mph 19.68 km/h
Ground pressure — unloaded	1.18 psi 0.083 kg/cm^2	Ground clearance — loaded	14.25 in 36 cm
— loaded	1.87 psi 0.131 kg/cm^2	Turning radius — minimum inside	104 in 264 cm
Overall width — tracks on	97.5 in 248 cm	Fording depth	42 in 106.8 cm
— tracks off	86 in 218.2 cm	Climbing ability — grade	60 %
		Sidehill ability — grade	40 %

MECHANICAL STANDARDS

Power Train:
Engine — Ford 240 C.I.D. 6-cylinder. Industrial gasoline
Transmission — New Process 435L, 4-speed forward, 1 reverse
Clutch — 12″ hydraulic controls
Final Drive — Controlled planetary differential in circulated oil bath c/w outer planetaries
Steering — Manual lever to hydraulic system
Brakes — Internal drum

Electrical:
Alternator — 45 amp, 12 volt
Battery — 70 amp/hr, HD

Running Gear:
Load Wheels — Rims: 5:50 x 16, 6-stud FN split rim
— Tires: 6:00 x 16, 10-ply smooth
Suspension — Walking beams, urethane bearings
Tracks — Rubber belts and drop centre steel grouser
Sprockets — Steel with replaceable urethane inserts
Elevated front idlers — Solid rubber

Cab:
Two-man, steel; domelight; headlights; panel light; wipers — two speed; manual choke; fuel capacity — 25 imp gallons (114 litres).
Color — International orange.
Instruments — temperature gauge; ammeter; oil gauge; hour-meter; fuel gauge.

Frame:
Welded tub

MISCELLANEOUS STANDARD EQUIPMENT

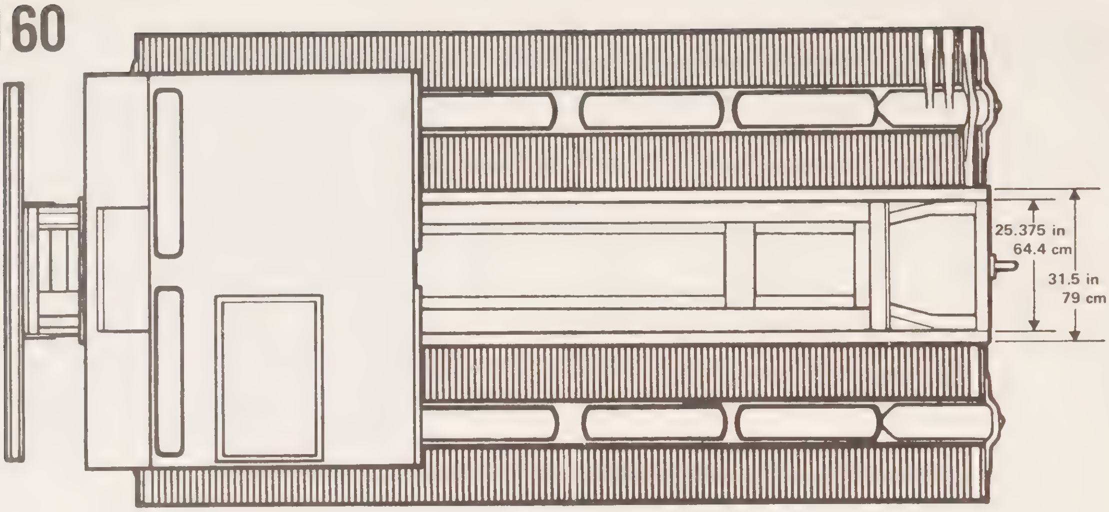
Pintle hook

Muffler
Exhaust pipe rain caps

Operator's, maintenance and parts manuals (2 sets)
Tool kit
Antifreeze
Full under pan (3 removable sections)

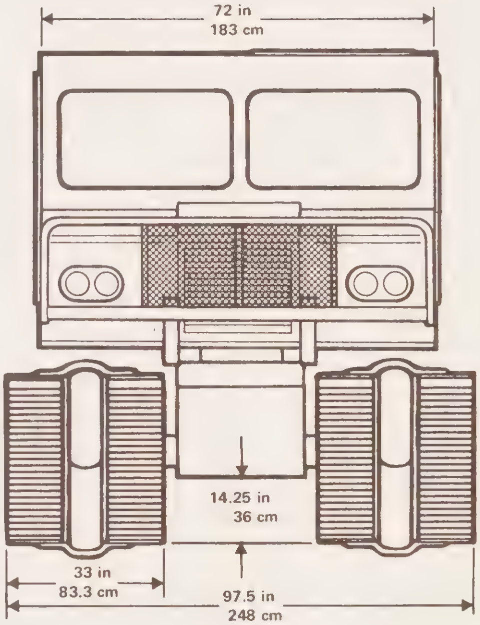
OPTIONS AVAILABLE including diesel engines and automatic transmissions. *Subject to change without notice*

FN 60

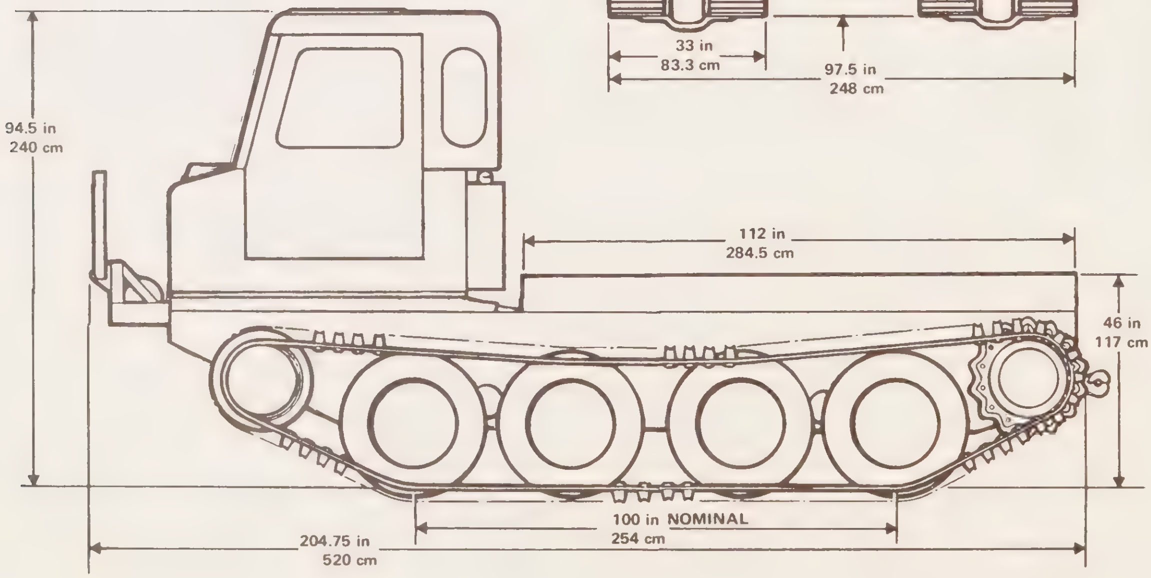


25.375 in
64.4 cm
31.5 in
79 cm

NOTES



72 in
183 cm
14.25 in
36 cm
33 in
83.3 cm
97.5 in
248 cm



94.5 in
240 cm
112 in
284.5 cm
46 in
117 cm
100 in NOMINAL
254 cm
204.75 in
520 cm

STUDY 5

THE FEASIBILITY OF ESTABLISHING CERTAIN AGRICULTURAL ENTERPRISES IN THE NORTHWEST TERRITORIES

TABLE OF CONTENTS

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1. INTRODUCTION

The Northwest Territories is dependent to a large extent on food imported from the South, much of which could be grown locally. The feasibility of growing a large variety of crops both indoors and in greenhouses has been proven many times in southern locations but the technology has only recently been applied to the North.

This report examines the opportunities for establishing a commercial greenhouse, a hydroponic greenhouse and a battery hen egg production facility. It is against this background that we are pleased to present this report entitled "The Feasibility of Establishing Certain Agricultural Enterprises in the Northwest Territories", for your consideration.

2. SUMMARY

2.1 Background

Section 3 discusses the background for looking at possible agricultural enterprises and establishes the basic minimum criteria for a sound venture, i.e. it should provide a normal return on invested capital to compensate for the high risks involved and should provide a full-time job for at least the Owner/Manager.

2.2 Greenhouse - Yellowknife

Section 4 examines the feasibility of establishing a commercial greenhouse for tomatoes and other produce in Yellowknife. Due to the high costs of heating and possible problems associated with insufficient light, it was found that it would be uneconomic to operate the facility year-round.

Using data from similar southern operations as a base, the costs of production were calculated for a facility in Yellowknife. Assuming one full-time employee and 75% market share, the projected cost of tomatoes was found to be about 53.4¢ per pound compared to the average Yellowknife price of 52.7¢ per pound. In addition, there are often "specials" at much lower prices (the average price includes very high prices paid during the breakup and freeze-up periods). Also it would be most difficult

trying to capture such a high share of the market (75%), being so dependent on the three supermarkets. Quite simply, the market is not large enough to support the productive labour of even one individual.

Due to these factors we do not recommend establishing a commercial greenhouse in Yellowknife at this time.

2.3 Hydroponic Greenhouse - Fort Simpson

Section 5 examines the feasibility of establishing a commercial hydroponic greenhouse at one of the proposed pipeline compressor stations near Fort Simpson. The unit would receive heat directly from the compressor turbines and would produce fresh vegetables by hydroponic or soil-less techniques for sale in the Fort Simpson, Hay River, and Yellowknife geographical area.

Using data from similar operations in Southern Canada as a base, the costs of production were calculated for the projected Fort Simpson facility. Assuming one employee on contract for the operating period only and an 80% market share the projected cost of tomatoes would be about 59.8¢ per pound conpared to the average price of about 50¢ per pound. As the calculations assumed that heating would be supplied at no cost the actual cost of tomatoes would be even higher. Although hydroponic produce commands a premium price in Southern Canada it is doubtful that the share of market could be maintained if the tomatoes were priced at, say, the break-even price of 60¢-65¢ per pound.

Similar to conventional greenhouses, the main problems for the hydroponic operation are the limited market size and the high fixed costs. In addition there would likely be some problems in the new heat transfer technology and in operating and maintaining production of the first hydroponic unit in the Northwest Territories.

Due to these factors we do not recommend establishing a commercial hydroponic greenhouse in the Fort Simpson area at this time.

2.4 Egg Production - Yellowknife

Section 6 examines the feasibility of establishing an egg production operation in Yellowknife.

Although the marketing problems would be significantly less, it appears that the high cost of shipping the feed and the high fixed costs associated with the required building and equipment would make the business unprofitable at current prices. As such, we do not recommend establishing a commercial battery hen egg production facility in Yellowknife at this time.

3. BACKGROUND

In the course of our study of possible entrepreneurial opportunities, agricultural enterprises were often mentioned. Greenhouses using conventional techniques or hydroponic greenhouses which do not use any soil would seem a natural response to the high cost of fresh produce in the Northwest Territories. In conjunction with the porposed natural gas pipeline it is also often suggested that these greenhouses could use the excess heat which will be generated at each of the compressor stations along the route.

There are many possible criteria for such ventures:

* providing fresh produce in outlying settlements;
* reducing the cost of produce in the larger settlements;
* providing work and economic opportunities for northern residents;
* lessening the real and psychological dependence of the N.W.T. on Southern Canada; and
* furthering knowledge about possible future agricultural ventures in the North.

Since this entire study is concerned with the identification of entrepreneurial opportunities, we have looked at the venture from the perspective of locating a sound, profitable business. At a minimum, the business should provide a healthy return on the invested capital and a full-time occupation for the Owner/Manager.

4. GREENHOUSE OPERATIONS - YELLOWKNIFE

4.1 Market Characteristics

The largest market for fresh produce in the Northwest Territories is Yellowknife with a population of over 8,000. Within Yellowknife, three supermarkets, four hotels, several restaurants, and a number of institutions make up the entire market. As in the South, their primary concerns are:

* consistent and reliable supply;
* high quality; and
* competitive prices.

In every one of these areas, with the possible exception of price, a small local supplier will be at a considerable competitive disadvantage compared to the large established producers in Southern Canada, California and Mexico.

Using average Canadian consumption figures for 1972, the total market for several possible items of produce can be estimated. A population of 9,000 has been used to allow for the high transient population and market growth.

Table 1

Estimated Market Demand - Yellowknife

	Estimated Consumption (lbs)
Carrots	117,000
Cabbage	86,000
Celery	58,000
Cucumbers	15,000
Onions	104,000
Lettuce	99,000
Tomatoes	109,000

Of these vegetables only tomatoes, cucumbers and lettuce are grown in volume in commercial greenhouses in Southern Canada. However, due to the high cost of produce in many northern communities, it may be possible to grow a wider rande of crops profitably.

4.2 Economics of Operation - Ontario

In order to assess the economics of operating a greenhouse in the Northwest Territories we have first examined operations in Southern Canada. Tables 2 and 3 show average yields, income, investment and costs per pound for greenhouse tomato growers in Essex County in Southern Ontario. These are mostly relatively small family-operated units.

We have chosen to show the economics of tomato production because this is the major crop grown in greenhouses throughout North America, it would be the main crop and financial backbone of a commercial greenhouse in the N.W.T., and because it requires a relatively high labour content.

Table 2

Greenhouse Tomato Production - Essex County (1973)

Yield Per Plant	
Spring Tomatoes	11.7 lbs.
Fall Tomatoes	2.9
	14.6 lbs.
Yield Per Square Foot	
Spring Tomatoes	3.08 lbs.
Fall Tomatoes	.75
	3.83 lbs.
Average Gross Return to Grower	
Spring Tomatoes	$0.35/lb.
Fall Tomatoes	0.28
	$0.337/lb.
Average Capital Investment	$2.33 per square foot
Average Greenhouse Area	50,160 square feet
Average Yearly Production	182,456 lb. tomatoes

Table 3

Greenhouse Tomato Production Costs, Essex County (1973)

	Costs Per Pound ¢
Hired Labour	2.0
Production Supplies	1.6
Heating	5.4
Truck	0.4
Utilities	0.6
Legal, Accounting	0.1
Other	0.2
Insurance	0.5
Maintenance	1.4
Interest on Operating Capital	0.4
Taxes	0.6
Marketing Charges	4.8
	18.0
Interest on Investment	4.9
Depreciation	3.1
Family Labour	6.8
TOTAL COST	32.8

One of the first items to notice about the Ontario operations is that the production of an average unit, about 182,000 pounds of tomatoes, is considerably larger than the entire market in Yellowknife, which is about 109,000 pounds. This immediately points out the problem of the limited market size and shows the need to estimate the share of market that could be captured by a local producer.

4.3 Economics of Operation - Yellowknife

One factor restricting the market potential of local produce would be the high cost of winter operation due to heating costs. Table 4 shows the average monthly temperatures for Yellowknife and calculates the number of heating degree-days assuming an inside temperature requirement of 70°F. The heating costs were calculated using this information and using a cost of heating formula calculated by the University of Kentucky.

Table 4

Heating Degree-Days - Yellowknife

Month	Mean Temperature	Heating Degree-Days (70°F)*
January	-19	2,759
February	-14	2,352
March	-1	2,201
April	18	1,560
May	39	961
June	54	480
July	61	279
August	57	403
September	49	630
October	30	1,240
November	7	1,953
December	-11	2,511
		17,329

*Heating Degree-Days (70°F): January 89 x 31 days = 2,759 degree days

The Climate of the Mackenzie Valley, Vol. 1, B.M. Burns, 1973.

Table 5

Greenhouse Heating Costs - Yellowknife

Assume a Tunnel Greenhouse	20' x 100'
Assume an Extreme Minimum Temperature	-40°F
Assume a Double Layer of Plastic or Glass	
Heat Requirements are Therefore	250,000 BTU/hr.
Assume the Greenhouse is Heated by Oil at	$0.40 per gallon
Heating Costs	$4,000 per year

The cost to heat a 2,000 square foot greenhouse in Yellowknife would be about $4,000 per year. Assuming three crops per year and an optimistic production of six pounds of tomatoes per square foot (Ontario average - 3.83 pounds per square foot), the resulting average cost of heating alone would be $0.33 per pound. The actual

cost for the winter months would be much higher and in addition there is some doubt concerning the effect of the limited daylight on production. For these reasons a greenhouse in Yellowknife should not be operated from November to February. This in fact coincides with greenhouse operations in Southern Canada, where winter operation is also uneconomical for most crops.

We are now in a position to estimate the cost of operations in Yellowknife. We have assumed that the yields in Yellowknife would be about the same as in Ontario and, as such, can relate directly to the Ontario figures from Table 3. We have also assumed that the production facilities will be as large as possible, constrained primarily by the size of the market. Costs (as given in Table 3), related to fixed facilities or supplies, have been raised 15% to cover freight and higher northern costs; labour costs have been increased 25% to cover the difference in minimum wage; and heating costs have been raised to cover the difference in heating degree-days between London, Ontario (7,400) and Yellowknife (17,329). The resulting estimated production costs of greenhouse grown tomatoes are as outlined in Table 6.

Table 6

Projected Greenhouse Tomato Production Costs - Yellowknife

	Cost per Pound
	¢
Hired Labour	2.5
Production Supplies	1.8
Heating	11.8
Truck	0.5
Utilities	0.8
Legal, Accounting	0.1
Other	0.2
Insurance	0.6
Maintenance	1.8
Interest on Operating Capital	0.5
Taxes	0.6
Marketing Charges	4.8
	26.0
Interest on Investment	5.6
Depreciation	3.5
COST BEFORE FAMILY LABOUR	35.2

This treatment gives an optimistic cost of $0.352 per pound of tomatoes before accounting for family labour. The cost of family labour will be fixed since a basic level of income will be required to support the family and to meet our earlier criteria for an entrepreneurial opportunity.

Let us assume a minimum required income from the greenhouse of $10,000 per annum for the family. As discussed previously it would be uneconomical to operate from November through to February. Assuming an optimistic growing period of two months, the greenhouse could market its produce from May through October, a total of six months. The total available market for tomatoes is therefore about one-half the annual consumption or about 55,000 pounds. If we assume that 75% of the family's income will result from tomatoes and that this greenhouse could capture 75% of the entire Yellowknife market during its productive season the resulting additional labour cost would be $0.182 per pound for a total cost of $0.534 per pound. Even assuming that the operator could somehow obtain 100% of the market, the average cost would only drop to $0.488 per pound.

As shown in Exhibit I, the actual price of tomatoes in Yellowknife varies considerably, reaching a peak during breakup and freeze-up. Based on past experience the average retail price for tomatoes, not including specials, is about $0.58 a pound. Allowing for a retail markup of 10%, the price to the producer would be $0.527. This price is slightly less than the estimate for cost of production in Yellowknife ($0.534) assuming a 75% share of market. Two further problems in the area of pricing would be the competition from "specials", which are often 30% lower in price, and, even more damaging, the fact that prices would have to be artificially inflated during the breakup and freeze-up periods in spite of the fact that the tomatoes were being produced locally. Without the high prices in these periods to balance the below cost prices during the summer months the operation would be totally unprofitable.

There are several other factors posing a threat to the venture, namely:

* being a captive supplier to three large and competing supermarkets;
* having to obtain 75% of the entire market; and

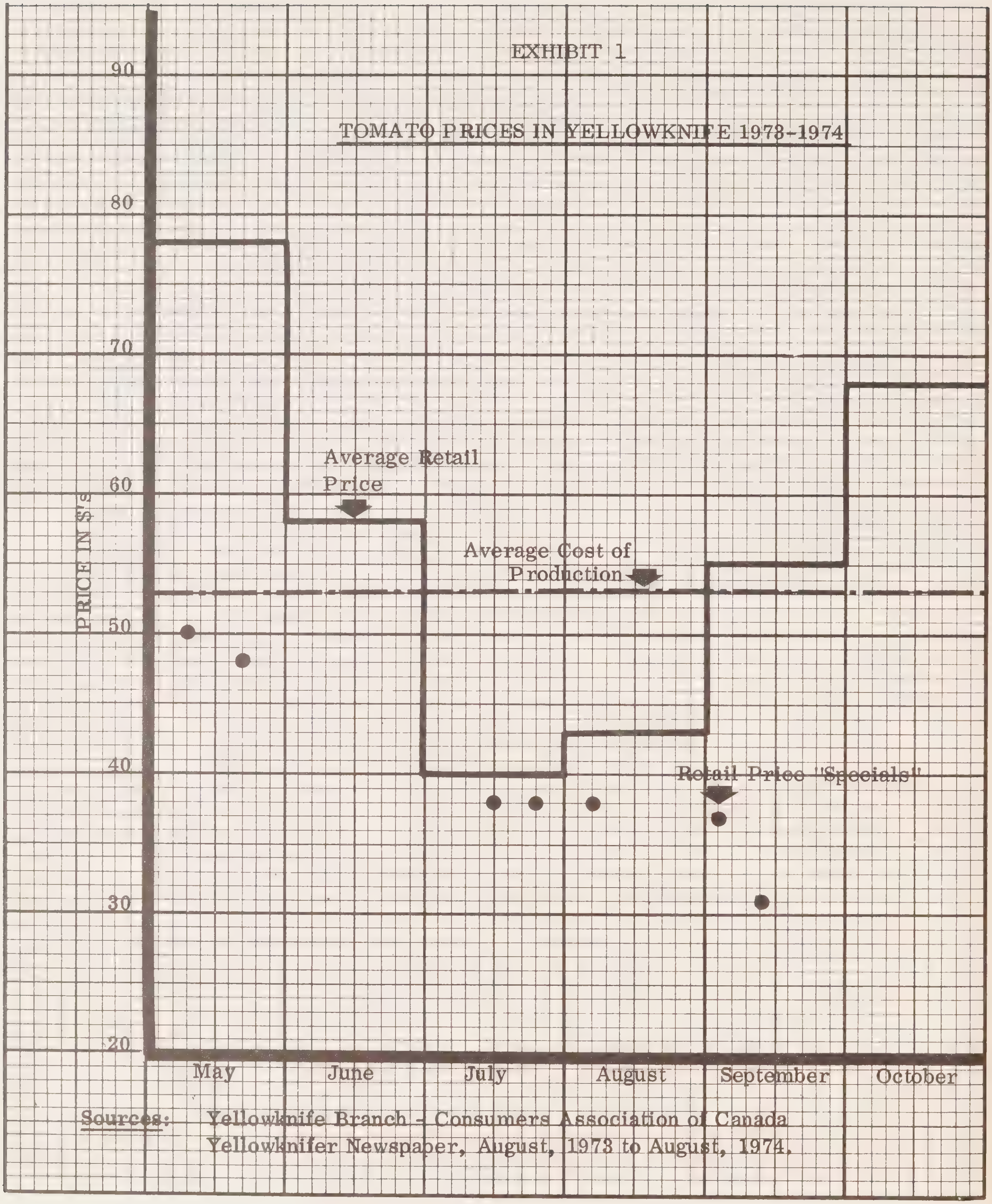
EXHIBIT 1
TOMATO PRICES IN YELLOWKNIFE 1973-1974
PRICE IN $'s
90
80
70
60
50
40
30
20
Average Retail Price
Average Cost of Production
Retail Price "Specials"
May
June
July
August
September
October
Sources: Yellowknife Branch - Consumers Association of Canada
Yellowknifer Newspaper, August, 1973 to August, 1974.

* having to maintain and guarantee a consistent level of production of high quality produce.

Because it would be difficult to cover the outlined costs under even the most optimistic assumptions and because of the marketing problems, we do not believe that a commercial greenhouse would be a profitable undertaking in Yellowknife at this time.

5. HYDROPONIC GREENHOUSE COMPRESSOR STATION

5.1 General

To counter the high cost of heating and the economics of scale of an ordinary greenhouse, it has often been suggested that produce could be grown by hydroponic methods utilizing the exhaust heat from compressor stations along the proposed Mackenzie Valley Pipeline.

Hydroponics is the growing of produce in a soil-less medium such as vermiculite, sand, or straw and providing the required nutrients in a water solution. This method yields a higher quality produce and has been used on a small scale for many years especially in Northern Europe. The operating costs for a commercial sized unit are somewhat higher than for a normal greenhouse but this is offset by the higher prices usually received.

The compressor stations along the pipeline will each contain a 30,000 HP turbine engine and will release considerable amounts of hot exhaust which could be used directly or converted into heat for a greenhouse.

As in the case of a conventional greenhouse, the primary constraint to commercial operation is likely to be the size of the market. Within the Northwest Territories there are two possible locations along the proposed pipeline: Fort Simpson and Inuvik. The market potential for a facility near Fort Simpson which could serve Fort Simpson, Yellowknife and Hay River would be about 14,000 persons.

5.2 Economics of Operation - Ontario

The following estimates of operating costs were developed for a proposed hydroponic installation in Southern Ontario by Hydroponics Limited of Toronto. Production is assumed to be 15 pounds per plant for the spring crop and five pounds per plant for the fall crop for an average production of eight pounds per square foot. This compares to an average of 3.8 pounds per square foot in the conventional greenhouse examined in Section 4.

Table 7

Projected Hydroponic Tomato Production Costs, Sarnia (1973)

	Cost per Pound ¢
Labour	10.0
Production Supplies	2.4
Heating	8.3
Electiricty	1.7
Insurance	0.5
Maintenance	1.3
Licences	0.1
Supervisory and Pathologist	7.2
Contingency	2.0
Accounting and Legal	0.8
Marketing	2.1
Other	0.4
	36.8
Depreciation	5.1
Interest	6.9
TOTAL COST PER POUND	48.8

A comparison between the costs of a conventional greenhouse (Table 3) and Table 7 shows that most of the hydroponic items of costs are slightly higher. The most significant differences are the higher capital costs, depreciation and interest for the hydroponic unit, and the higher labour input, especially if we include the management and pathology requirements. The only cost which is lower for the hydroponic unit is the marketing charges which drop considerably as a result of direct sales to retail outlets.

5.3 Economics of Operation - Fort Simpson

Using these costs as a base we can project the costs of a similar operation in Fort Simpson. One major addition will be the cost of shipping the produce from the compressor station location to the communities where it will be sold. Assuming a round trip of about 1,100 miles twice a week to Fort Simpson, Hay River, Yellowknife and back to the compressor station, and assuming a delivery contract at about $0.20 per mile, the total cost would be about $440 per week for delivery alone. Although the technical feasibility of tapping the heat from the compressor stations has not yet been proven (extensive research is being carried out at the University of Saskatchewan), for our purposes we will assume that all the heating requirements can be provided at no cost.

In calculating the costs of production, building and material costs have been increased 20% and costs related to labour have been increased 25%. Although we are basically considering a one man operation, at certain peak periods extra labour will be required and we have included 1/3 of the labour cost in the cost estimate.

Table 8

Projected Hydroponic Tomato Production Costs, Compressor Station

	Cost per Pound ¢
Labour	3.3
Production Supplies	2.9
Heating	-
Electricity	2.0
Insurance	0.6
Maintenance	1.6
Licenses	0.1
Contingency	2.0
Accounting and Legal	1.0
Marketing	2.1
Other	0.5
	16.1
Depreciation	6.1
Interest	8.3
COST PER POUND BEFORE LABOUR AND DELIVERY	30.5

Assuming that the unit is in operation for ten months of the year, and producing tomatoes for eight months, the total market demand at the three communities would be about 14,000 pounds per month or about 112,000 pounds in total. Unfortunately the road access to Hay River and Yellowknife would be cut off during the breakup and freeze-up periods. Although we anticipate some technical difficulties, we have optimistically assumed that the hydroponic unit could plan production in such a way as to provide enough green tomatoes for storage before these periods and thereby avoid losing these markets. In this case the premium prices expected during the freeze-up and breakup would go to the retailer and not to the producer.

Due to the higher level of technical skills involved in operating a hydroponic greenhouse and the relative isolation of the compressor station we are assuming a fixed labour cost of $2,000 per month, including accommodation, 75% of which would have to come from the sale of tomatoes.

As was pointed out earlier, the primary competitive edge of the hydroponic greenhouses is the very high quality product, which commands in the south a premium price of about 10¢ per pound. We will test the profitability under two assumptions:

1. assuming a price of 10¢ per pound above the average and capturing 50% of the market; and
2. assuming the tomatoes sell at the average price but that 80% of the market can be taken.

As shown in Table 9, in case one, the labour and delivery charges would amount to $0.468 per pound and in case two, $02.93 per pound. Therefore, the advantage of the higher pirce in case one would be completely wiped out by the loss in market share.

Assuming that 80% of the entire market can be captured the total wholesale cost of the tomatoes, therefore, would be about 59.8¢ per pound. Using the pricing information presented earlier in Exhibit I but eliminating the extra high prices during breakup and freeze-up, the average wholesale price for tomatoes in Yellowknife has been about $0.50 per pound. Prices in Hay River would be even lower.

Table 9

Projected Hydroponic Labour and Delivery Costs

1. *Assume 50% of Market*

Fixed labour cost 10 months @ $2,000	$20,000
Fixed delivery cost 34 weeks @ $440	14,960
	$34,960
Assume 75% to come from tomatoes	$26,220
Total Tomatoe Market	112,000 lbs.
Assume 50%	56,000 lbs.
Cost per Pound	$0.468 per lb.

2. *Assume 80% of Market*

Fixed Tomato Costs	$26,220
80% of Market	89,600 lb.
Cost Per Pound	$0.293 per lb.

Based on optimistic cost estimates, as used in this study, yielding prices for hydroponically grown tomatoes about 20% higher than current prices (assuming 80% of the total market); the technical problems concerning heat transfer from the compressor stations; and the technical difficulties involved in the operation of a hydroponic unit in the far North, it does not appear that a commercial hydroponic greenhouse would be a profitable undertaking in the Fort Simpson area at this time.

6. EGG PRODUCTION

6.1 Market for Eggs

The size of the market for fresh eggs can be estimated in a number of ways. Using the 1972 Canadian average of 31 pounds of eggs per person, the Yellowknife demand would be about 152,000 dozen per year. The three supermarkets in Yellowknife estimate total consumption of 3,800 dozen per week for a total of 198,000 dozen for the year. Mr. Wes MacAleer estimated a market in Yellowknife of 3,000 dozen per week or 156,000 dozen per year (feasibility report "Concerning the Operation of a Commercial Poultry Farm in the Northwest Territories"). For the

purposes of this study, we will use a market size of 160,000 dozen per year in Yellowknife.

At present all the eggs sold in the Yellowknife area come from Alberta. The Northwest Territories used to buy eggs from all over Canada at the best available price but this has been stopped by the Alberta Egg Marketing Board and a stable high price market has resulted. Unlike fresh produce and many other food items, the marketing of eggs is strongly controlled by local producer boards and prices stay about the same year round, with very little seasonal fluctuations.

The managers of the two largest supermarkets in Yellowknife both felt strongly that locally produced eggs would be in great demand and could command a premium price. The local producer would have to grade and package the eggs and deliver them directly to the supermarkets.

6.2 Economics of Operation - Yellowknife

Assuming that a local facility could capture 75% of the market, it would have to produce about 120,000 dozen per year. Since the facility would have to shut down for about one month every year while the birds were replaced and the facilities were sterilized, the net market would be about 110,000 dozen.

The production per bird varies considerably from facility to facility and is directly related to the quality of management. Mr. MacAleer assumes an average production of 19.1 dozen per bird for the first eleven months. The Canadian average is about 18.5 dozen per bird over a thirteen month laying period. (The Canadian average for "more efficient producers" is about 20.1 dozen per hen for a twelve month period according to the Canadian Federation of Agriculture.) We will assume a moderately efficient production of 18 dozen per hen for eleven months. Therefore, about 6,100 hens would be needed to produce the 110,000 dozen eggs required.

The capital facilities required to house the 6,100 hens in layered cages would cost about $9.00 per bird, for a total of $54,900. This compares with about $7.00 per bird across Canada and about $8.00 per bird in Alberta. Equipment for manure handling, for outside work, and for grading the eggs would be an additional

$15,000, plus about $5,000 for a delivery and "odd-jobs" truck. The hens purchased at 20 weeks of age would add a further unit cost of $2.25. Allowing for a mortality of 8%, about 6,600 would be required at a cost of $14,850 plus about $2,500 for transportation. The total capital cost would therefore be about $92,250.

The largest single item in the cost of production is feed. Assuming 4.4 pounds of feed per dozen eggs and a cost of $149 per ton in Edmonton plus $50 per ton bulk shipping cost to Yellowknife, the total feed cost would be about $48,000.

Labour to feed, clean and tend the flock would be about four hours per 1,000 birds per week. At $3.50 per hour plus 10% for benefits the cost would be $4,880 per year. During the remainder of this time, this person (with occasional back-up) would also be responsible for delivery of the eggs to the supermarkets and other buyers. Assuming four hours per day, five days a week, the cost would be $4,000 per year. Grading would require about 57 hours per week at $2.50 per hour plus 10% for benefits for an eleven month cost of $7,500. Therefore the total labour cost would be about $16,400.

During August, 1974, landed costs for eggs in Yellowknife were about $0.99 to $1.02 per dozen for Grade A large eggs with retail prices about $1.11 per dozen. Prices were relatively stable all summer with occasional specials at $0.99 to $1.04 per dozen. Although fresh eggs could probably command a premium price, we have assumed a wholesale price of $0.99 per dozen for Grade A large. Assuming 70% Grade A large and corresponding prices for the other grades, total income from the 109,800 dozen eggs should be about $97,430. Some slavage value should be obtainable from the hens which are killed after eleven months of production. For the purposes of this study we have assumed a salvage value of 20% of the original cost.

The projection of income and expenses, as summarized in Table 10, shows a forecasted loss of about $9,300 after allowing for depreciation and interest on the required capital. As the rates for hourly wages used in the calculation ($2.50 to $3.50) are the bare minimum the actual losses could even be higher.

Even if all the capital needed for the venture was in the form of a grant the business would yield the

Table 10

PROJECTED BATTERY HEN OPERATION - YELLOWKNIFE

Sales

Total Production 6,100 Hens @ 18 dozen = 109,800 dozen

Grade A Large	70% @ $.990 per dozen	$76,091
Grade A Medium	13% @ $.921	13,146
Grade A Small	5% @ $.776	4,260
Grade B & C	5% @ $.358	1,965
Cracks & Rejects	7% @ $.256	1,968
		$97,430

Cost of Production

Feed 4.4 lb. per dozen eggs @ $149 per ton	$35,992
Shipping @ $50 per ton	12,078
Labour & wages 4 hr. per 1,000 hens @ $3.50/hr. + 10%	4,885
Labour & wages grading 40 doz/hr. @ $2.50/hr. + 10%	7,549
Labour & wages delivery 4 hr/day @ $3.50/hr. + 10%	4,004
Truck operating expenses $50/week	2,600
Packaging cost $.06 per dozen	6,588
Cost of hens ($17,350 less 20%)	13,880
	$87,567
Gross Income	$ 9,863

General & Administrative Expenses

Insurance, Maintenance & Taxes	$ 1,500
Utilities	1,000
Depreciation Building (20 yr.) and Equipment (8 yr.)	4,620
Depreciation Truck (5 yr.)	1,000
Cost of Capital @ 12% of $92,250	11,070
	$19,190
Net Profit (Loss)	$ (9,327)

operator less than $2,000 in profits; hardly an attractive proposition.

When compared to the national average as shown in Table 11, the major differences are the higher cost of transportation for the feed; the higher cost of the birds due to the eleven month production and cost of transport; and the higher cost for buildings and equipment due to the need for new facilities and the higher costs of building in the north. These are offset by the higher prices received by selling direct to the retailers; this apparent margin, however, is reduced by the costs of grading, packaging and delivery.

Table 11 shows the difference between the projections developed in this study and previous projections done by Wesmac Agencies for an egg facility in Fort Providence. There is a slight difference in selling price which is mostly accounted for by the extra shipping cost on the feed. The Wesmac labour costs are slightly higher but grading costs are much lower. The projected marketing and delivery costs are also much lower and in view of the high costs of delivery from Fort Providence to Yellowknife and Hay River may have been underestimated.

The projected cost of hens for Yellowknife is marginally higher due to the annual one month shut down for sterilization, and the slightly more conservative productivity. In the area of general costs, the Wesmac projections are much lower for depreciation and interest, as a result of using a 30 to 40 year depreciation on the buildings and equipment and interest rates of only 9%.

In conclusion, it appears that an egg production facility in Yellowknife would not be profitable, primarily because of the high costs of transportation for the required feed and also the high capital costs involved in starting a new operation. Therefore we do not recommend an egg production facility in Yellowknife at this time.

Table 11

COMPARISON OF COSTS PER DOZEN EGGS
(¢ Per Dozen Eggs)

	Canadian Average	Projected Yellowknife	Wes Mac/ Fort Providence
	¢	¢	¢
Average Sales Price	66.1	88.7	85.5
Feed	33.9	32.8	33.3
Feed Shipping	-	11.0	9.5
Labour & Wages	4.5	4.4	5.9
Grading	7.0	6.9	2.0
Marketing Cost	2.8	6.0	1.4
Packaging Cost	-	6.0	6.0
Cost of Hens	9.9	12.6	12.1
	58.1	79.7	70.2
Gross Income	8.0	9.0	15.3
General Overhead	3.3	2.3	3.8
Depreciation & Interest on B&E	2.2	15.2	9.1
	5.5	17.5	12.9
Net Profit (Loss)	2.5	(8.5)	2.4

APPENDIX A

MAJOR SOURCES OF PUBLISHED INFORMATION OF BENEFIT TO THE STUDY

Social and Economic Surveys Including Demographic and Community Data

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Forecast of Highway Users in the Northwest Territories, Preliminary Findings, by Indian and Northern Affairs, June, 1974.

Hay River Industrial Development Study - Transportation Projections for Hay River, by Stanley Associates Engineering Ltd., March, 1974.

Hotel Feasibility Study Fort McPherson, Northwest Territories, by Laventhol, Kreskstein, Horwath prepared for Department of Indian and Northern Affairs, May, 1973.

Land Use Information Series 44 maps. by S.G. de Belle, P.H. Beaubier and S.D. Thomson. ALUR Program, Indian and Northern Affairs, 1972.

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Location, Design Capacities of Facilities	Sec. 8
Connecting Pipeline Facilities	Sec. 9
Construction Plan	Sec. 13(a)
Operations and Manufacture Plan	Sec. 13(b)
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Northern Training Program	Sec. 14(f)

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APPENDIX B.

MAJOR SOURCES OF INFORMATION ADVICE AND COUNSEL

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Anglin, P.	Chief, Policy & Planning ACND Division, Northern Policy & Program Planning Branch, INA.
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Whitney, P.M.	Sociologist, Mackenzie Highway Project, Northern Policy & Program Planning Branch, INA.

EDMONTON/CALGARY

Harvie, J.A.	V.P. Engineering, Canadian Arctic Gas Pipeline Ltd.
Herd, L.	Manager of Planning, Canadian Arctic Gas Pipeline Ltd.
Mackenzie-Hall W.	Director, Alberta & NWT Regions, Department of Industry, Trade & Commerce.
Maclean, Don J.	Mackenzie Aviation System Study, Transport Canada.
McFarlane, R.G.	Deputy Minister, Office of Program Coordination, Government of Alberta.
Sax, F. Donald	Senior Municipal Engineer & Planner, S.A. Stanley Associates Ltd.
Schorn, M. Elden	Executive Liaison Officer, Northern Department Group, Government of Alberta.

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Eplett, William S.	President, Hydroponics Limited.

NORTHWEST TERRITORIES

Messrs.	Department of Economic Development, Government of the Northwest Territories.
Auchterlonie, T. Bennett, C. Bergasse, J.A. Billingsley, D. Bird, C.D. Burns, R. Dixon, R. Espie, T. Firth, L. Jones, G.A. Lofthouse, P. Milligan, R. Rozon, G. Ruggles, J.	
Adam, Rev. Father O.M.I.	Rector Roman Catholic Church, Inuvik.
Bank Managers	All Branch Managers in the Territories.
Ganske, A.E.	Chief Town Planning & Lands, Government of the Northwest Territories.
Gryba, W.A.	Regional Director, INA.
McClure, R.	Director, NWT Housing Corporation.
Munro, J.	Project Coordinator, Petroleum Resource Development, Project Group, Government of the Northwest Territories.
Robertson, J.	President, Mack Travel.
Other	Businessmen in the various settlements; towns and cities; settlement officers and councillors; citizens.

ALASKA

Fisher, Dr. V.	Chairman, Institute of Social, Economic & Government Research, University of Alaska.
Miller, R.	Manager, Public Affairs, Alyeska Pipeline Service Company.
Pavitt, R.W.	Director, Planning & Research, Office of the Governor.